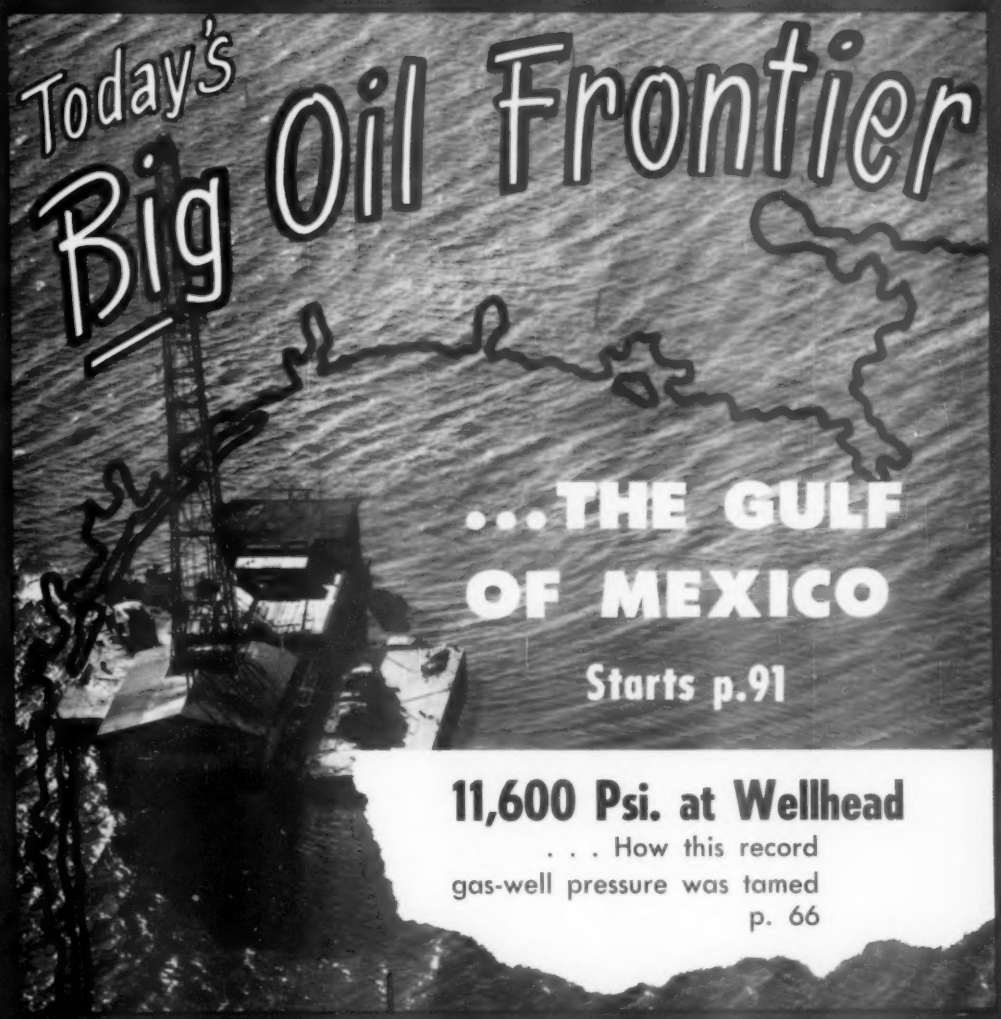
the OIL AND GAS JOURNAL

FEBRUARY 11, 1957



11,600 Psi. at Wellhead

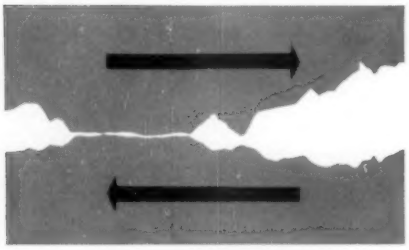
. . . How this record gas-well pressure was tamed p. 66

Israel's Answer to Getting Oil to Europe. p. 86

WHY VALVE LUBRICATION SAVES MONEY

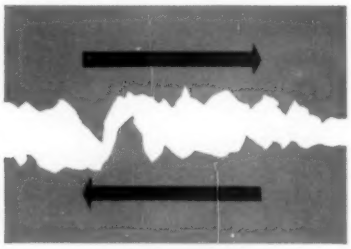
TROUBLE STARTS WHEN METAL RUBS METAL...

Under the microscope, metal that appears mirror-smooth to the naked eye shows as sharp mountains and deep valleys. This roughness, combined with the heat and pressure of metal-to-metal rubbing, causes valve trouble in the following ways:



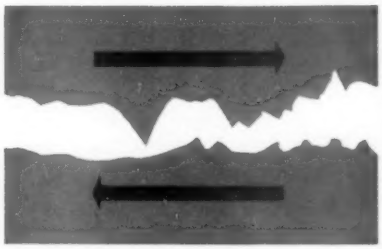
STICKING

"Cold Welding" occurs when friction or pressure welds the peaks together. The result: sticking.



SHEARING

The "hills" of one surface gouge into the hills of the other surface causing further sticking and scoring.

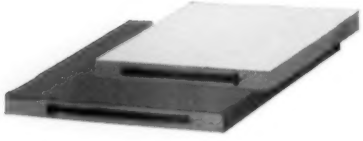


PLOWING

If one surface is even slightly harder than the other, the hard peaks act like a "plow". Leakage soon results.

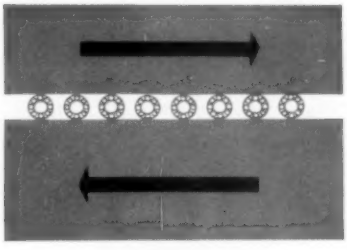
BUT, WITH ROCKWELL-NORDSTROM VALVE LUBRICATION...

metal-to-metal contact is eliminated. Here's what happens when metal-to-metal surfaces are lubricated:



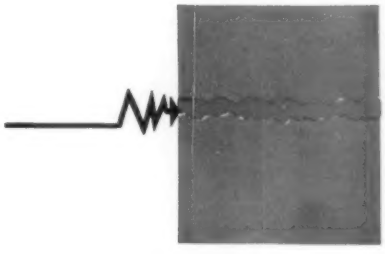
SLIDING

Lubricant prevents friction heat, eliminating danger of cold welding and assuring easy movement.



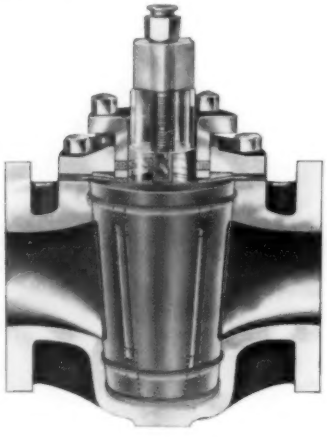
ROLLING

Lubricant becomes millions of tiny bearings . . . metal surfaces actually never come into contact with one another.



SEALING

Pressurized lubricant forms an impenetrable, continuous seal against leakage.



LONGER LIFE, LOWER COST, better valve service results when you specify Rockwell-Nordstrom lubricated plug valves. Notice in the drawing at the left how lubricant protects all the working surfaces and seals positively against leakage. Since lubricant eliminates adhesion, shearing and plowing, Rockwell-Nordstrom valves cost you less to use . . . year after year. Rockwell-Nordstrom valves are available in a complete range of sizes and pressure ratings to answer every flow control need. They cost no more to buy, often less, than ordinary valves. See your nearest supplier or write Rockwell Manufacturing Company, Pittsburgh 8, Pa. for complete details.

Canadian Valve Licensee: Peacock Brothers Limited

ROCKWELL-Nordstrom **VALVES**

LUBRICANT SEALED FOR POSITIVE SHUT-OFF

A Glance Ahead

- **What's the weather**—6 months from now? Meteorologists think the time isn't far off when they can tell that far ahead. Experiments now being made point in that direction. They're made possible by new computers and data-processing equipment which can analyze the vast volume of information involved. If long-range forecasting moves into the realm of a more accurate science, it'll have tremendous impact on industries where weather is a factor. That includes oil.

- **Atomic power for big tankers** is getting closer. The United Kingdom Atomic Research Establishment at Harwell is building an experimental nuclear propulsion unit. Plans call for its completion this year. The power plant could push Queen Mary-size tankers around the cape at 28-30 knots.

  Petroleum products—will be used to cool the nuclear reactor. If this type of system works out, the propulsion units could be built and run a lot cheaper than liquid-metal units built in the United States, according to British scientists. But costs still would be higher than conventional steam turbine, at least for now.

- **Management's headaches are just beginning.** Students of long-range economic trends predict: Capital invested in tools per worker will continue its dizzy rise . . . National resources will start declining, taxing management to find new sources of raw materials . . . Struggle of competing elements in our society—labor, government, investors—for bigger share of production will stiffen. The result will be a premium on statesmanship all around.

- **Ohio Oil Co.'s Wood River-Chicago products line** should get under way this fall. The company has obtained a commitment for pipe delivery to begin in the last quarter. The 350-mile, 12-in. common carrier will have ultimate capacity of 100,000 bbl. per day. It will make more space available for products directly from the Mid-Continent to Chicago. And it will get around the low-water bottleneck which hampers barge traffic up the Mississippi and Illinois rivers.

- **Contributors to at least one committee** set up in 1955 to press the Harris gas bill may find their donations are not deductible for tax purposes. The Internal Revenue Service reportedly is readying a ruling that the "educational" efforts of the committee headed by Leonard F. McCollum of Continental Oil Co. were designed to influence legislation. The committee got almost $2 million in contributions from oil and gas companies.

- **Familiar government strategy is shaping up** in the $33 billion federally sponsored highway program. The tune is this: Get a project started and then find out that more tax revenue is needed for completion. In the case of highways, federal officials now are proposing another 1-cent federal gasoline tax. States also are looking at this source of revenue. Washington insiders advise strong opposition at the state and federal levels will be necessary this year to stop unwarranted increases.

- **Russian technologists now are talking of using** progressive explosive drilling. The method consists of inserting ampoules of explosives into the hole along with the washing fluid. The subsequent blast breaks up hard rock that makes cutting difficult. Look for articles to start appearing soon on the technique in the Russian press.

the OIL AND GAS JOURNAL

FEBRUARY 11, 1957 • VOLUME 55 • NUMBER 6

THE STAFF

TULSA OFFICE
211 South Cheyenne Ave.
Phone Diamond 3-6291

Kenneth B. Barnes ..... Editor
Henry D. Ralph ..... Chief Editorial Writer
Ted A. Armstrong ..... News Editor
Gerald L. Farrar ..... Engineering Editor
Dr. Frank J. Gardner ..... Exploration Editor
Paul Reed ..... Pipeline Editor
John C. Reidel ..... Petrochemical Editor
C. O. Willson ..... Consulting Editor
W. L. Nelson ..... Technical Editor
Lynn M. Nichols ..... Presentation Editor
John C. Casper ..... Economics Editor
Neil Williams ..... Associate Editor
Norman S. Morrisey ..... Drilling-Development Editor
Gene T. Kinney ..... Assistant Pipeline Editor
R. B. Tuttle ..... Equipment Editor
Bill Linville ..... Assistant to Presentation Editor
Carl Hoot ..... District Editor
Carl J. Lawrence ..... District Editor
John C. McCaslin ..... District Editor
W. A. Bachman ..... District Editor
J. O. Scott ..... District Editor
J. C. Bradford ..... District Editor
Robert B. Bizal ..... District Editor
Sara Bangert ..... District Editor
LaWanda Turner ..... Readership Research
Helen Brown ..... Editorial Assistant
Alice Burt ..... Editorial Assistant
Ailleen Cantrell ..... Editorial Assistant
C. Dudley Johnston ..... Art Director
Jo Jeanne Speaker ..... Staff Artist

NEW YORK OFFICE
500 Fifth Avenue
Phone LOngacre 4-6160

George H. Weber ..... Refining Editor
Paul Swain ..... International Editor
Ray G. Gibson ..... District Editor
John P. O'Donnell ..... District Editor

HOUSTON OFFICE
802 Sterling Building
Phone CApitol 4-7726

Larry Resen ..... District Editor
Ed McGhee ..... District Editor
Joe Reilly ..... District Editor

DALLAS OFFICE
1238 Mercantile Building
Phone RIverside 8-3074

Robert J. Enright ..... District Editor

LOS ANGELES OFFICE
650 South Grand Avenue
Phone VAndyke 0722

D. H. Stormont ..... District Editor
William T. Smith ..... District Editor

WASHINGTON OFFICE
621 Albee Building
Phone DIstrict 7-1710

Bertram F. Linz ..... District Editor

Correspondents at Denver, Pittsburgh, Calgary, Columbus, Ashland, Ky., Oil City, Pa., Mount Pleasant, Mich., Melbourne, Australia; Regina, Sask.; Chatham, Ont.; Casper, Wyo., and Anchorage, Alaska.

The Oil and Gas Journal, Published Mondays, copyright 1957, by The Petroleum Publishing Co. Entered as second-class matter September 1, 1910, at post office at Tulsa, Okla., under act of March 3, 1879. United States and foreign rates to the petroleum industry, 1 year $4, 2 years $7, 3 years $8.

IN THE NEWS

General Interest:

Crude Flow to Europe May Climb Higher ... 62
A.P.I. Has New Theme: Educate Congress ... 64
Demand Overtaking Natural-Gas Supply in North Dakota ... 67
Seafarers International Union Gains Offshore Foothold ... 70
Technical School's "Road Show" Packs 'em In ... 70
Underground Storage Paying Off in California ... 72
Los Angeles Seeks Uniform Policy for Granting Leases ... 82
U. S. Exports Reflect Middle East Crisis ... 84
Nasser Says Sahara Petroleum Won't Be "Egyptianized" ... 85

Processing:

Strike Threat Looms at Sinclair Oil Corp. ... 68
Record Construction Outlay Set By Chemical Industry ... 68
Processing Briefs ... 73
Spadework Under Way for Refinery at Haines, Alaska ... 81

Production:

Record 11,600 psi. Gaged By Louisiana Producer ... 66
Californians Beautify a Drill Site ... 71
Oklahoma Water Flood "Stores Up" for Drouth ... 78
Gamma Rays Measure Porosity of Formations ... 82

Pipelining:

Trans-Canada Gets Final Construction Permit ... 72
Union Plans 225-Mile Crude Line to Oleum Refinery ... 73
Four Corners-Los Angeles Crude Line Firmed Up ... 74
Record Centrifugal Compressors Booked by Gulf Interstate ... 80
Pipeline Briefs ... 81
Short Line Beats Tall Problems In Sicily ... 85
Israel Dangles Bypass Bait to Keep Aqaba Gulf Open ... 86
Record 42-Mile Aluminum Line Planned in Colombia ... 88
I.P.C. Cuts Labor Force In Syria and Lebanon ... 88

Drilling and Exploration:

Alabama Leases Disputed Offshore Tracts ... 65
Compact Drilling Barge Planned by New Firm ... 69
Panamanian Firms Moving Rig to Greek Island of Zanta ... 87
Mississippi Braces for New Drilling Campaign ... 171
Five Strikes Put Paradox Up Front ... 177

OIL AND GAS PIPELINES • REFINING • PETROCHEMICALS
EXPLORATION • DRILLING • PRODUCTION • FIELD PROCESSING

. . . an integrated magazine serving an integrated industry

TECHNOLOGY—OPERATION

Drilling-Production-Exploration

SPECIAL OFFSHORE REPORT **91-101**

Today's Big Oil Frontier—The Gulf of Mexico **91**

The most promising place to look for a giant field is the offshore area. Thus, far, 1 of every 20 offshore wildcats has turned up a field with more than 50,000,000 bbl. of reserves. A roundup on fields, prospects, industry expenditures, reserves, and equipment in the Texas-Louisiana offshore area.

Louisiana Offshore Shows Bright Promise **96**

By Gordon L. Atwater

America's newest oil province is the Continental Shelf of the Gulf of Mexico. It has already become a major oil-and-gas-producing area at an early stage in its development. The most important part of this new oil province is the offshore area of southern Louisiana.

Evaluating an Oil Property **111**

By E. A. Polumbus, Jr.

Oil reserves, participation, value of oil, and operational expenses are all part of the total picture in determining the cash realization from a property. Here is how they're all tied together. Part 2 of two parts.

What Those French Turbodrill Tests Show **121**

By J. O. Scott

Tests of the Neyrpic turbodrill in France show rates of penetration averaging six times higher than those obtained with conventional rotary drilling. This was due to greater weight on the bit and higher rate of rotation.

Refining-Processing

Lubrication Tips for Gas Plants **102**

By Edward D. Shannon

Humble learned 10 things about gas-plant lubrication during gas-engine tests and overall study of the plant lubrication program.

How Gulf Purifies its Boiler Water **106**

By Larry Resen

Port Arthur refinery supplements condensate supply with demineralized water for supplying high-pressure boilers, to prevent silica deposition on turbine blades and boiler tubes.

The Foreman's Page **129**

Equipment Design and Operation **130**

Questions on Technology **133**

How refinery size affects profit picture—a three-page report.

Pipelining

Detailed Report: Pipeline Construction, 1953-55 . . . . . **116**

During 1953-55, 31,105 miles of pipe for transporting crude and products was laid in the United States. Here is a detailed breakdown on these lines, by state, size, and companies.

Pipeline Patrol: Expediting Right-of-Way **139**

By Frank A. Smith

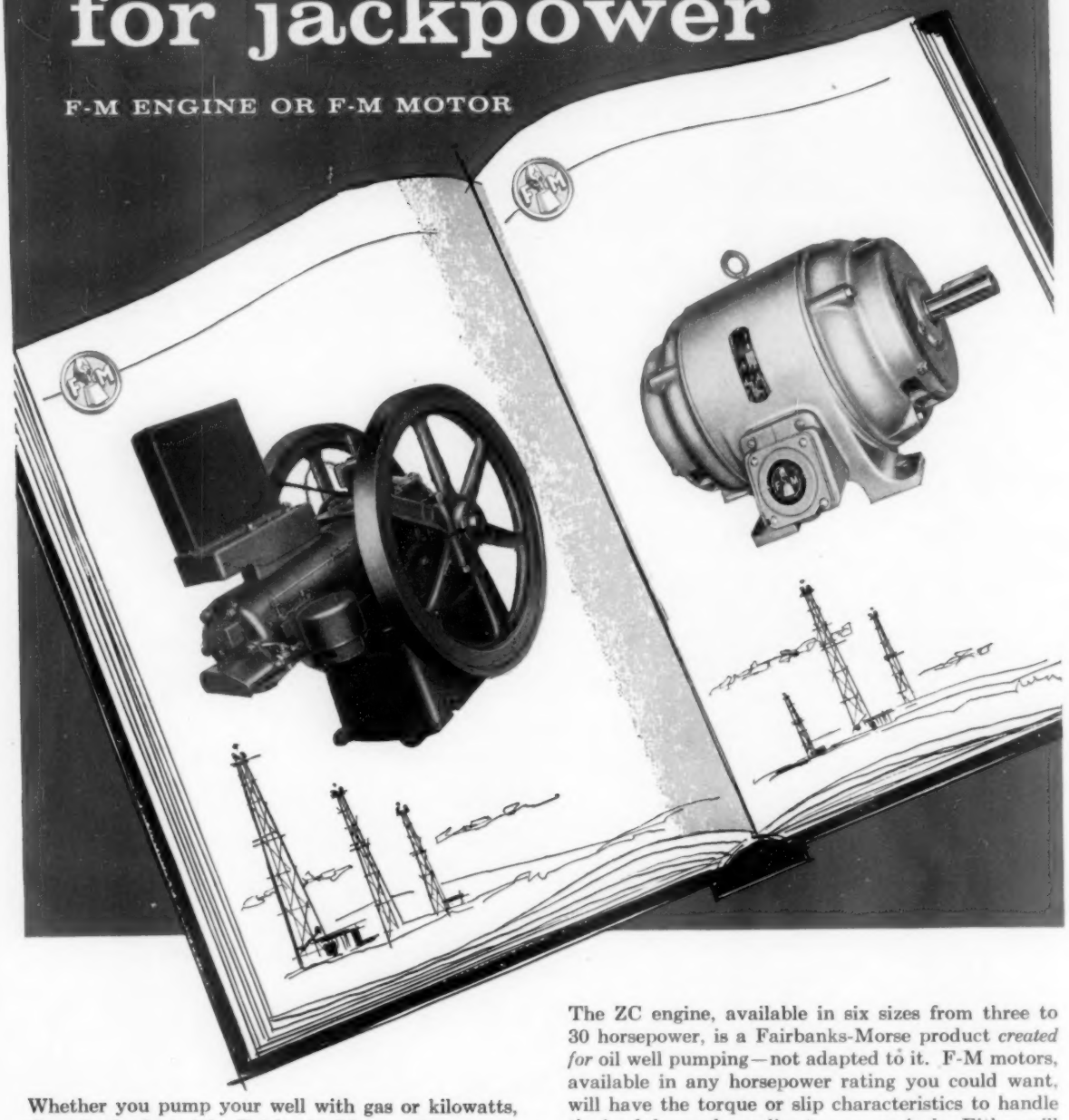
An outline of a suggested procedure for handling all right-of-way problems. Provisions are made for special cases.

DEPARTMENTS

A Glance Ahead	1	The Foreman's Page	129	Personals	199
They Say	45	Equipment Design and Operation	130	Statistical Summary	202
Calendar of Events	50	Questions on Technology	133	Drilling Statistics	203
Journally Speaking	57	Pipeline Patrol	139	Supply Statistics	204
Editorial	59	Drilling Contractors	144	Refining Statistics	205
This Week	61	Equipment Digest	150	Markets	206
Watching Washington	65	Equipment Men in News	166	Classified Advertising	207
International News	85	Exploration Highlights	171	Advertisers' Index	213

for jackpower

F-M ENGINE OR F-M MOTOR



Whether you pump your well with gas or kilowatts, there is the just-right Fairbanks-Morse prime mover for the job. Today's Fairbanks-Morse engines are the result of the design and manufacturing experience of 70 years; today's Fairbanks-Morse motors have a similar tradition of half a century.

The ZC engine, available in six sizes from three to 30 horsepower, is a Fairbanks-Morse product *created for* oil well pumping—not adapted to it. F-M motors, available in any horsepower rating you could want, will have the torque or slip characteristics to handle the load demand peculiar to a pump jack. Either will do its job efficiently and economically.

See your local supply store or write Fairbanks, Morse & Co., Oil Field Division, 600 South Michigan Avenue, Chicago 5, Illinois.

FAIRBANKS-MORSE

a name worth remembering when you want the BEST

OIL FIELD EQUIPMENT • PUMPS • SCALES • ELECTRIC MOTORS • GENERATORS • LIGHT PLANTS • DIESEL, DUAL FUEL AND GASOLINE ENGINES • MAGNETOS • DIESEL LOCOMOTIVES

B.F.Goodrich

No danger of burst with B. F. Goodrich rotary drilling hose

B. F. Goodrich builds a rotary drilling hose you can put out of your mind when you put it on your rig. No more worries about hose blowouts, shutdown time, damage to drilling bit or rig, or possible injury to the crew. Here's the story—inside and out—on this stronger, longer-lasting Highflex rotary drilling hose.

Spiral-wrapped cable wires make it resistant to bursts, qualify it for Grade C (5000 lb. test pressure) American Petroleum Institute. Hose ends are reinforced with additional plies of wire and fabric to protect against bending stress at the couplings. Extra strength here means extra safety for your crew and rig—no hose blowouts at the coupling.

Strong as it is, B. F. Goodrich Highflex is still the most flexible hose made for heavy-duty service. It's easy to attach to the rig, hangs well from the standpipe, coils easily without kinking.

The thick, tough cover on Highflex resists gouges, scrapes, tears. Sun, wind and rain will not weaken it. Oily mud will not cause swelling or rotting of the tube.

You'll find B. F. Goodrich Highflex hose at leading supply stores in the oil field, or at any of these B. F. Goodrich warehouses: Los Angeles, Great Bend, New Orleans, Hobbs, Oklahoma City, Tulsa, Dallas, Houston, Odessa, Wichita Falls. *B. F. Goodrich Industrial Products Company, Dept. M-868, Akron 18, Ohio.*

B.F.Goodrich

INDUSTRIAL PRODUCTS

"Oilwell" Waterflood Pumps...

. . . give you more for your money in . . .

HYDRAULIC HORSEPOWER—Compare the product of volume and pressure at given operating speeds between different make pumps and see for yourself.

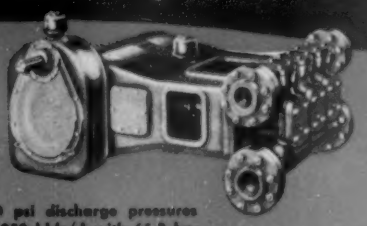
ACCESSIBILITY—Horizontal construction eliminates the dangerous use of step ladders in servicing operations.

MAINTENANCE SAVINGS — Heavy-duty construction together with moderate operating speeds mean longer life for packing, plungers, valves and seats.

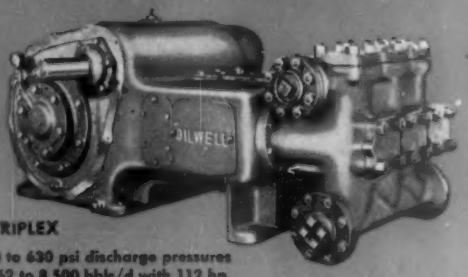
RELIABILITY — "Oilwell" pioneered the application of horizontal plunger pumps for waterflood services and has made more installations than any other pump builder. This application experience, backed by the operating records of the many users, is your best assurance of successful pump performance throughout the life of your waterflood.

NOW . . . choice of four pump frame sizes

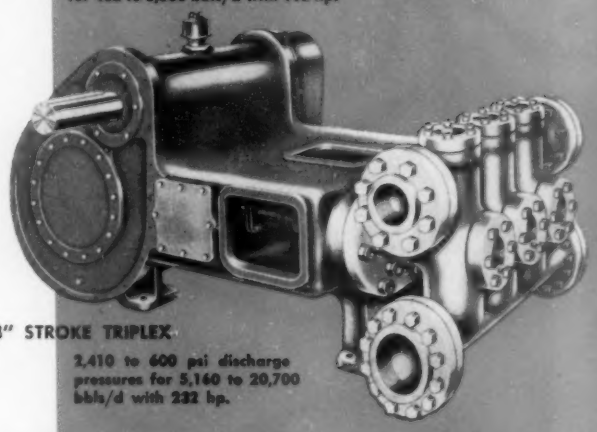
. . . representing the most complete line of horizontal power pumps in the industry . . . provides a wide range of plunger diameters to best suit your operating requirements with minimum input horsepower. A choice of material for fluid-ends, plungers and valve service is available.



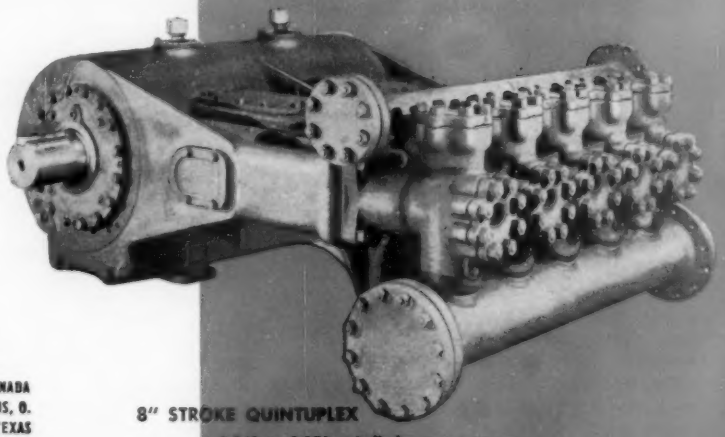
4" STROKE TRIPLEX
5,000 to 400 psi discharge pressures for 560 to 6,850 bbls/d with 66.8 hp.



6" STROKE TRIPLEX
5,650 to 630 psi discharge pressures for 462 to 8,500 bbls/d with 112 hp.



8" STROKE TRIPLEX
2,410 to 600 psi discharge pressures for 5,160 to 20,700 bbls/d with 232 hp.



8" STROKE QUINTUPLEX
3,540 to 1,270 psi discharge pressures for 7,340 to 20,400 bbls/d with 490 hp.

OIL WELL SUPPLY
DIVISION, UNITED STATES STEEL CORPORATION

Executive Offices—DALLAS, TEXAS
Export Office—
30 ROCKEFELLER PLAZA
NEW YORK 20, N. Y.

Area Offices—
CALGARY, CANADA
CASPER, WYOMING.....COLUMBUS, O.
DALLAS, TEXAS.....HOUSTON, TEXAS
TULSA, OKLA.....LOS ANGELES, CALIF.

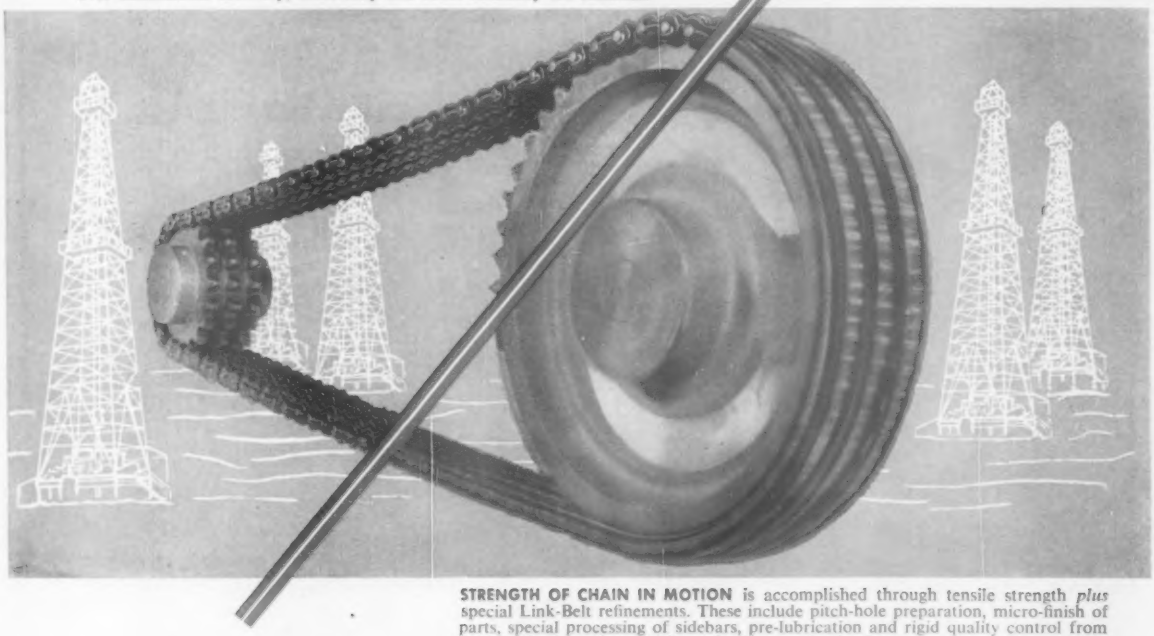
USS TRADE MARK

"OILWELL"
TRADE MARK

UNITED STATES STEEL

Not just static strength, but . . .

RESISTANCE TO TENSILE STRESS is achieved by use of properly heat-treated, accurately-machined sidebars made of premium steel and fitted with properly-hardened pins, bushings and rollers. But to resist *operational* stresses, additional controls over dimensional accuracy, uniformity and roller resiliency are essential.



STRENGTH OF CHAIN IN MOTION is accomplished through tensile strength *plus* special Link-Belt refinements. These include pitch-hole preparation, micro-finish of parts, special processing of sidebars, pre-lubrication and rigid quality control from initial selection of materials to final protective boxing.

dynamic strength

assures longer work-life for LINK-BELT Roller Chain

TO MEET increasing demands for greater speed and depth, today's drives must be capable of taking terrific punishment. And *dynamic* strength—capacity of chain to resist severe operating stresses—is of vital importance.

That's why EXTRA dynamic strength is built into every length of Link-Belt Precision Steel Roller Chain. It's your assurance of lasting, efficient performance that shrugs off stresses due to engagement with sprockets, shock of starting, centrifugal loads.

Link-Belt develops exceptional dynamic strength by combining special methods of design, manufacturing and processing with proved "extras." Extras that pay off in reduced drilling costs and less down-time.

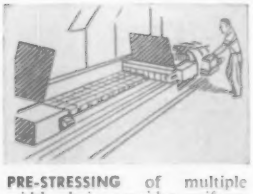
You can get full information at your nearby Link-Belt office or any leading supply store in the field. Ask for Book 2680, covering this complete line of single and multiple widths up to 3-inch pitch.

LINK-BELT

ROLLER CHAIN & SPROCKETS

LINK-BELT COMPANY: Indianapolis 6, Houston 1, Dallas 21, Odessa, Tex., Shreveport, La., Los Angeles 33, Scarboro (Toronto 13); Export Office, New York 7. Distributors in All Fields. 14.304

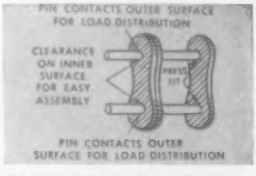
LINK-BELT gives you dynamic strength that comes from these important EXTRAS



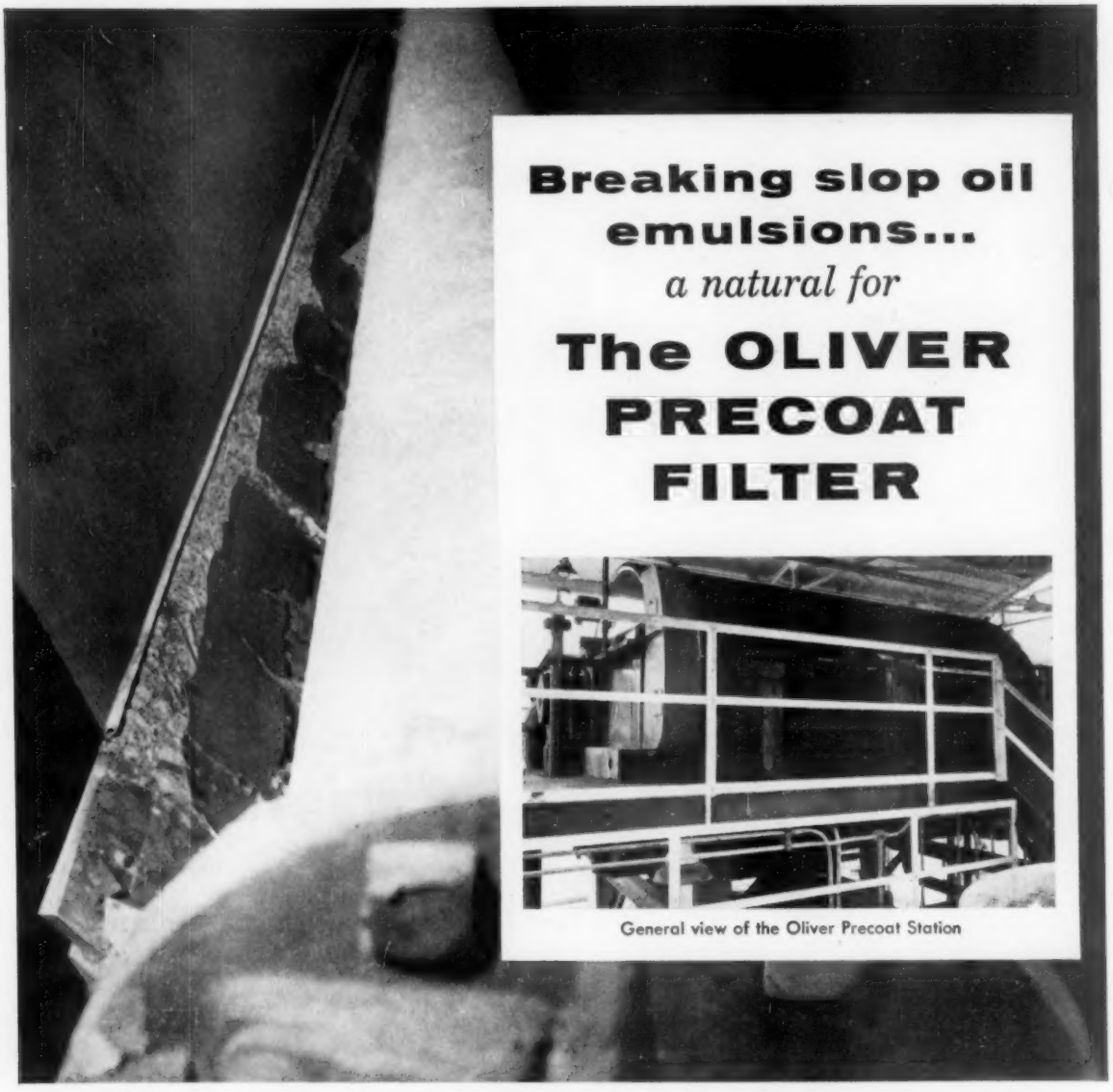
PRE-STRESSING of multiple width chain provides uniform load distribution.

SHOT-PEENED ROLLERS have greater fatigue life, added ability to withstand impact.

SHEPHERD'S CROOK COTTERS will remain in place under severe operating conditions.


PIN CONTACTS OUTER SURFACE FOR LOAD DISTRIBUTION
CLEARANCE ON INNER SURFACE FOR EASY ASSEMBLY
PRESS FIT
PIN CONTACTS OUTER SURFACE FOR LOAD DISTRIBUTION

FASTER COUPLING and uncoupling of multiple width chain with E-Z Assembly feature.



Breaking slop oil emulsions...

a natural for

The OLIVER PRECOAT FILTER

General view of the Oliver Precoat Station

Closeup of knife edge discharger clearly showing thin film of precoat and cake being continuously removed.

Recently installed at a large Southwestern Refinery, is another Oliver Precoat Filter for the handling of refinery slop oils.

The problem . . . continuous and economical removal of colloidal solids such as clay, coke, carbon, catalyst and some chemical emulsifiers from refinery slop oils thus permitting the separation of oil and water.

The Oliver Precoat Filter handles this heretofore considered "difficult to filter" material and delivers a filtrate which readily separates into oil and water phases.

Dorr-Oliver manufactures a complete line of filters — batch and continuous, for the petroleum industry. For more information on Oliver Petroleum Filters, write Dorr-Oliver Incorporated, Stamford, Conn.

DORR-OLIVER
INCORPORATED
WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT
STAMFORD • CONNECTICUT • U.S.A.

NOW...
See the new OLIVER OC-4

See how many jobs you can do with this pony-size powerhouse!

For scores of different jobs around the oil fields, pipelines and refineries, this little, low-cost tractor is the practical, sensible answer. It gives you proved performance with 21.8 drawbar h.p. and a host of new operating features that mean you can work easier and faster. Here are a few:

NEW 4-speed transmission with a wider selection of speeds—from 1½ to 5¼ m.p.h.

NEW, big 9" clutch for smooth operation, longer life.

NEW longer track for greater stability, and increased traction.

NEW ease and convenience for the operator, comfortable box type seat. Operator does more with less fatigue.

NEW low silhouette assures maximum visibility.

Best of all, the OC-4 costs far less than most specialized machines of limited ability. Look around your present jobs and see how many it can handle for you. It makes your equipment dollars do double duty.

Oliver now offers several different models with 21.8 drawbar h.p. to fit your needs with a full line of attachments, including loader, Jet-Trencher, dozer, angle-blade, Universal trencher, winch, etc.

Ask also about the "Little Boomer" for light pipe laying jobs. Its 2000-lb. lifting capacity is enough to carry 40′ length of pipe up to 12″ diameter. It frees your larger equipment for heavier work. Available with backfill blade and pipe bending shoes.

See your Oliver distributor today. Or write us.

OLIVER

THE OLIVER CORPORATION

400 West Madison Street, Chicago 6, Illinois

a complete line of industrial wheel and crawler tractors and matched allied equipment.

"DBM" MULTIPLEX BLOCKS
are preferred because...

HOOK, BLOCK and **LINK ADAPTER** are combined in one compact unit.

MULTI-PURPOSE HOOK DESIGN—both swivel and elevators can be supported simultaneously.

MAXIMUM COMPACTNESS—shortest unitized block made; also extremely narrow.

CONVENIENT WEIGHT ADJUSTMENT INTERNALLY—heavier or lighter by 20%.

ELEVEN SIZES with heavy duty bearings for high capacity.

For further information write P.O. Box 1348, Houston 1, Texas or see The Composite Catalog.

The "DBM" Multiplex is the clean-contoured block with a low center of gravity that gives it exceptional balance. The favorite where the going is toughest—on a portable rig demanding high capacity—plus compactness.

BAASH*ROSS
TOOL COMPANY
DIVISION OF JOY MANUFACTURING COMPANY

HOUSTON, TEXAS • ODESSA, TEXAS • LOS ANGELES, CALIFORNIA
OKLAHOMA CITY, OKLAHOMA • CANTON, OHIO • NEW YORK, NEW YORK
OLNEY, ILLINOIS • EDMONTON, ALBERTA, CANADA • MARACAIBO, VENEZUELA

There's MORE

For the petroleum industry...

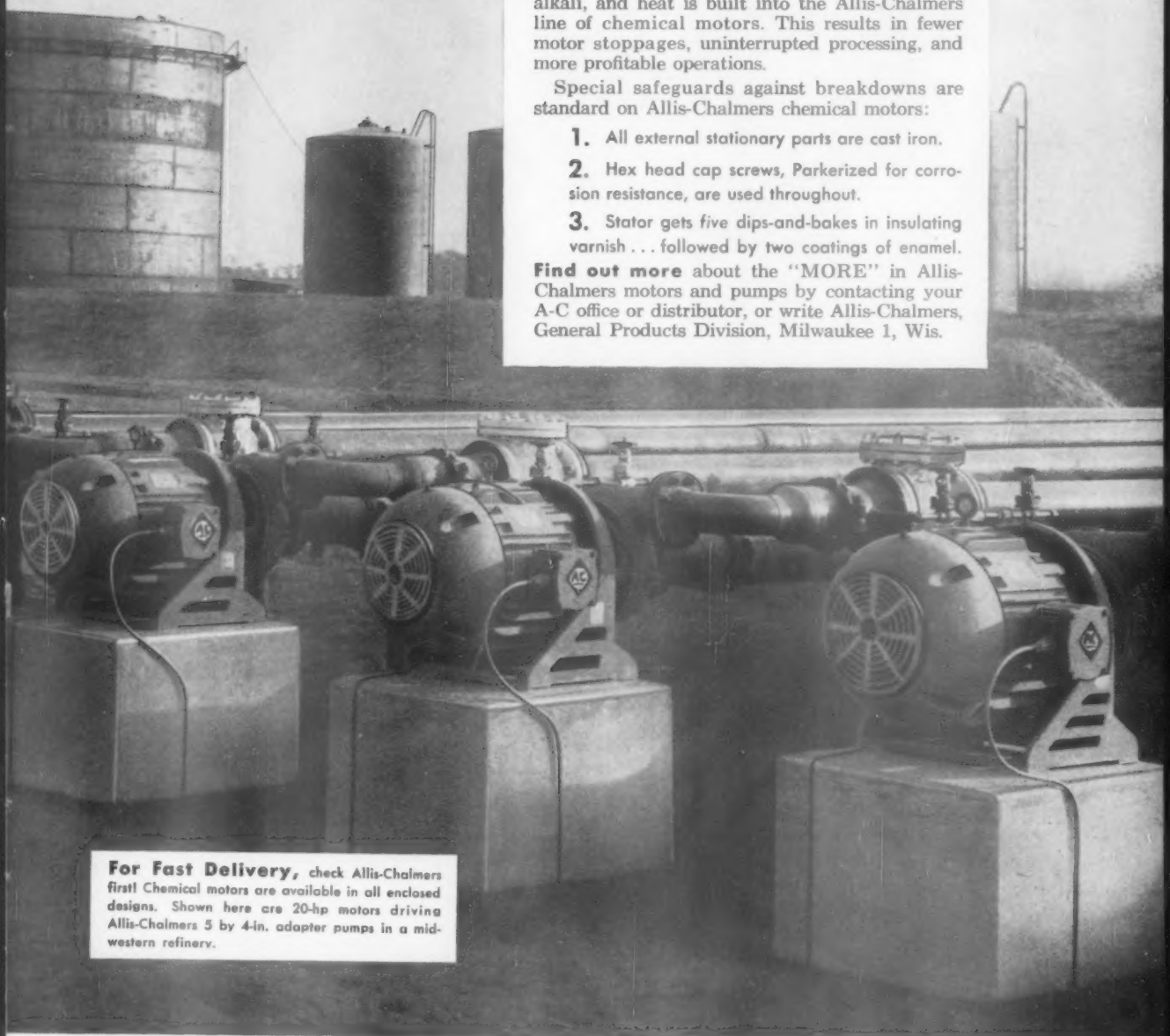
continuous processing with Allis-Chalmers chemical MOTORS and PUMPS

Maximum protection against moisture, acid, alkali, and heat is built into the Allis-Chalmers line of chemical motors. This results in fewer motor stoppages, uninterrupted processing, and more profitable operations.

Special safeguards against breakdowns are standard on Allis-Chalmers chemical motors:

1. All external stationary parts are cast iron.
2. Hex head cap screws, Parkerized for corrosion resistance, are used throughout.
3. Stator gets five dips-and-bakes in insulating varnish . . . followed by two coatings of enamel.

Find out more about the "MORE" in Allis-Chalmers motors and pumps by contacting your A-C office or distributor, or write Allis-Chalmers, General Products Division, Milwaukee 1, Wis.



For Fast Delivery, check Allis-Chalmers first! Chemical motors are available in all enclosed designs. Shown here are 20-hp motors driving Allis-Chalmers 5 by 4-in. adapter pumps in a mid-western refinery.

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

A-5168

NOTE: For new bromine method applicable to this instrument, see "Trace Unsaturation of Hydrocarbons by Coulometric Titration," by F. A. Leisey and J. F. Grutsch, Research, Department, Standard Oil Co. (Indiana) in the October issue of Analytical Chemistry, pg. 1553.

Now one unit does two jobs

The New Cenco® AUTOMATIC TITRATOR measures both mercaptans and olefins

Just by a change of electrodes and the flick of a switch, this one versatile instrument can measure both mercaptans and olefins . . . rapidly . . . accurately . . . and automatically. It's amazingly simple to operate—capable of titrating a wide range of concentrations without the use of standard solutions. And from 15 to 20 consecutive analyses can be run without an instrument adjustment. Reaction time registers in tenths of seconds directly on the Titrator.

Here's a dependable instrument, designed to economically increase efficiency in your laboratory operation. The unit is enclosed in a sturdy, compact metal case . . . finished in blue gray hammertone. The overall dimensions are 12″ x 12″ x 4½″.

The Cenco Automatic Titrator has been licensed under patent rights of the Standard Oil Company (Indiana).

No. 20928-1 Cenco Automatic Titrator, with electrodes for mercaptans—$565.00

No. 20928-2 Cenco Automatic Titrator with electrodes for olefins—$588.00

The combination instrument with both sets of electrodes, **$653.00**

For more information, write for circular No. 1264A.

cenco

The most complete line of scientific instruments and laboratory supplies in the world

RS

CENTRAL SCIENTIFIC COMPANY

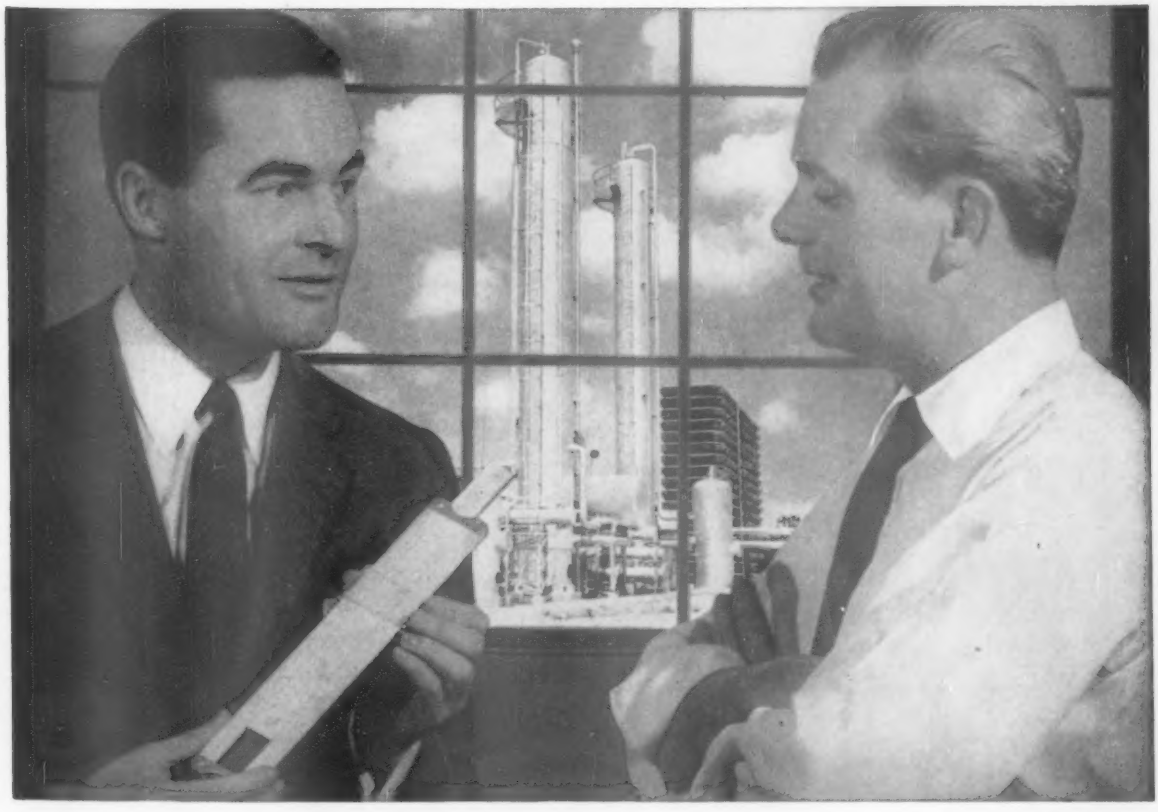
1724 IRVING PARK ROAD, CHICAGO 13, ILLINOIS

BRANCHES AND OFFICES—CHICAGO • MOUNTAINSIDE, N. J. • BOSTON • BIRMINGHAM • DETROIT

CENTRAL SCIENTIFIC CO. OF CALIFORNIA—SANTA CLARA • LOS ANGELES

REFINERY SUPPLY COMPANY—TULSA • HOUSTON

CENTRAL SCIENTIFIC CO. OF CANADA, LTD.—TORONTO • MONTREAL • VANCOUVER • OTTAWA



You get more than gas treating chemicals from CARBIDE...

CARBIDE's mono- or diethanolamine give you excellent removal of CO_2 and H_2S. By converting the extracted H_2S to sulfur or H_2SO_4, you benefit by recovering a valuable product—thus reducing your operating costs.

CARBIDE's di- or triethylene glycol remove H_2O economically from gas streams. The low initial investment and low operating costs of glycol type plants provide minimum dehydration charges.

Plus Benefits

- Technical data gathered from 22 years experience producing and supplying gas treating chemicals. These data can help you in construction of new facilities, the enlargement of present equipment and in securing trouble free performance of existing plants.
- Technical help from field representatives and service laboratories.
- Fast delivery from warehouses located near major gas fields.
- Constant source of supply.

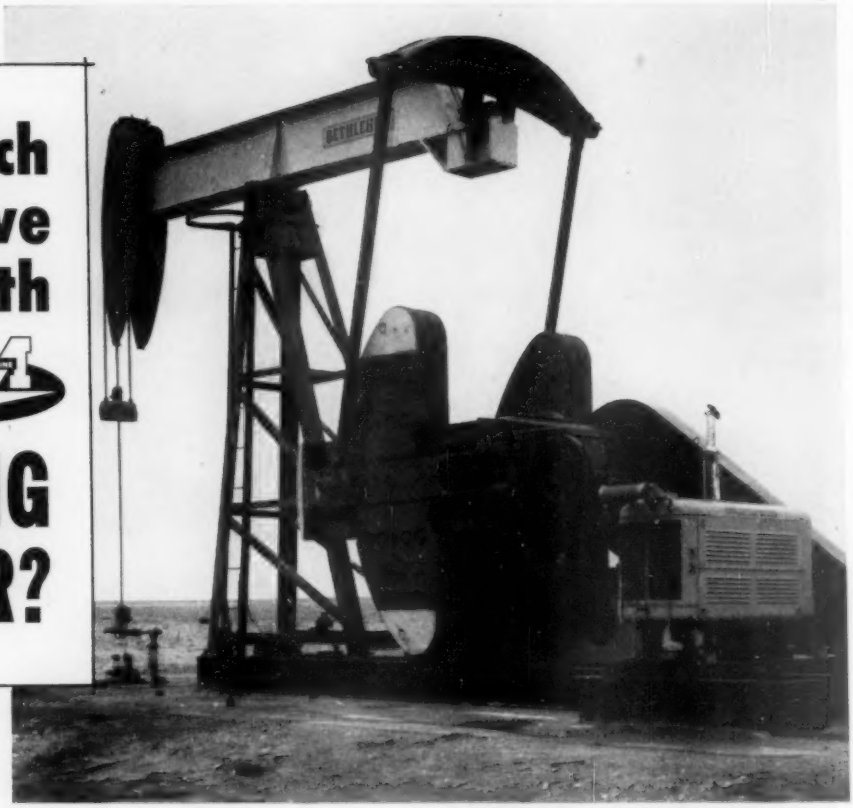
Find out for yourself how CARBIDE can help you. Write today to Carbide and Carbon Chemicals Company, Room 308, Department H, 30 East 42nd Street, New York 17, New York.

In Canada: Carbide Chemicals Company, Division of Union Carbide Canada Limited, Montreal. In Western Canada: Harrisons and Crossfield.

CARBIDE AND CARBON CHEMICALS

Carbide and Carbon Chemicals Company
A Division of
Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.

how much do you save per month with MM PUMPING POWER?



MM GAS-FUELED ENGINES

NET YOU $82 A MONTH ON EVERY 15-HP LOAD
...$197 A MONTH ON EVERY 35-HP LOAD
...$410 A MONTH ON EVERY 70-HP LOAD

MM high-turbulence combustion chambers provide complete fuel mixing, progressive burning, controlled pressure rise, greater torque at lower rpm
MM removable cylinder blocks offer lowest-cost maintenance, long skirt design for improved cooling. Extra crankcase depth below crankshaft centerline and heavy base-pan flange prevent distortion —reduce wear.
MM thermo-clad base-pans are completely water-jacketed for top-to-bottom temperature control and improved oil filtering.
ONLY MM ENGINES GIVE YOU THESE DOLLAR-SAVING ADVANTAGES!

Dollar savings over electric motor costs on wells pumped with gas-fueled Minneapolis-Moline engines go up with the horsepower size. The low cost of natural gas fuel as against electric power rates plus the big maintenance savings made possible by MM long-run design net you bigger returns with every barrel of crude you pump. These savings alone can retire the cost of the entire installation in a matter of months.

Gas-fueled MM engines offer flexible operation for variable requirements without costly drive pulley changes that go with constant-speed electric motors.

These added production profits belong on *your* books. Contact your MM oil field distributor for the facts on MM gas-fueled engines. Ask about the important maintenance convenience offered by SECO flat-rate service.

INDUSTRIAL POWER DIVISION
MINNEAPOLIS-MOLINE MINNEAPOLIS 1, MINNESOTA
THE GOLDEN POWER LINE

DISTRIBUTED BY
SECO
SHRIMPTON MANUFACTURING & SUPPLY CO.

OKLAHOMA CITY
Tel. JAckson 5-0225
LOS ANGELES
Tel. RAymond 3-6549
ODESSA
Tel. FEderal 7-4088
KILGORE
Tel. 4311
GLENDIVE

TIMED PRECISION

SIMPLIFIES SUCCESSFUL TESTING

WITH HALLIBURTON'S

HYDRO-SPRING TESTER

For a successful test with minimum down-time, Halliburton's smooth-working team of testing tools gets reliable results and provides for fast round trips and minimizes excessive strains on rig and equipment. Every tool in the Halliburton string is designed to give you dependable accuracy and important time and money saving advantages: 1. Faster make-up because tools are properly integrated to provide a compact string for the specific job. 2. Faster, easier running in, with greater protection to the well and the string. 3. Simple operation with provision for controlled operation of each tool in proper sequence, using hydrostatic pressure to fullest advantage where possible for setting packer and opening and closing valves. 4. Quick, easy access to recording instruments without waiting to unmake joints. 5. More accurate tests with fewer misruns because formation is better protected from surge pressures or other damage as string is run in.

Contributing to these important advantages is the Halliburton Hydro-Spring Tester – a combination of a Locked Open By-Pass and Tester, with a By-Pass valve that does not close until weight is applied to set the packer . . . and a Tester valve that opens after a time interval following the closing of the By-Pass valve. This time interval makes possible the accurate reading of the initial hydrostatic mud weight.

The simple design, rugged construction and easy, automatic operation of the Hydro-Spring Tester is typical of every testing tool in the Halliburton Testing String. It's just one of the many reasons why Halliburton is best for your drill stem test . . . best for your well . . . for accuracy . . . and for dependability. Investigate before you invest in a test. Call the local or district office or write the Halliburton Oil Well Cementing Company, Duncan, Oklahoma.

ASK FOR THE "FORMATION TESTING" BULLETIN

HALLIBURTON TESTING SERVICE

251 SERVICE CENTERS – JUST MINUTES AWAY FROM ANY RIG

Faster drilling...

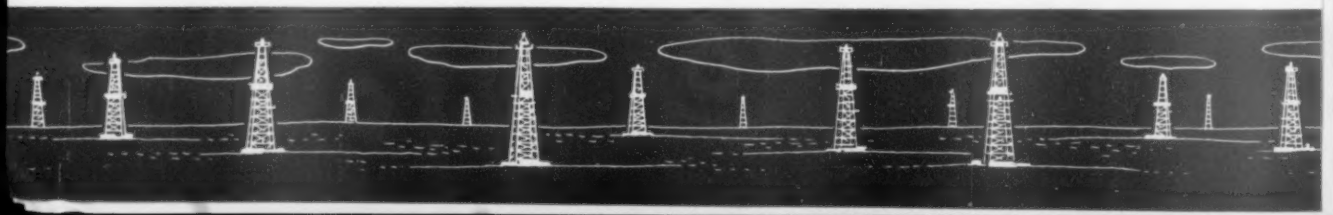
DRILLING MILK* pays off in faster, more economical drilling. It's a special emulsifier for clear water drilling and low solids fluids. It's made with Aquaness emulsifiers, the *original* high speed drilling fluid emulsifier—

- **Used successfully in over 500 wells**
- **Works in any water regardless of hardness or brine content**
- **Drills more feet per hour**
- **Prolongs bit life, eliminates hole trouble**

DRILLING MILK
is easy to use . . . doesn't foam, doesn't need constant attention. You can increase or decrease mud viscosity readily. Shale, sand and cuttings drop out quickly in mud pits.

Get the facts today by writing to Magcobar or by calling your local Magcobar service man.

DRILLING MILK Trade Mark Magnet Cove Barium Corporation*



LONGER BIT LIFE WITH FIELD PROVED OIL EMULSION FLUID!

Low-solids fluid speeds drilling, prevents hole trouble for Arapahoe Drilling Co. in Colorado well

Extremely bad loss circulation conditions were overcome through the use of DRILLING MILK, by Arapahoe Drilling Company. Drilling for Northwest Production Corporation on a well in La Plata County, Colorado, Arapahoe found that this low solids, low weight fluid gave excellent results in the Mesa Verde formation.

The contractor reports faster penetration, longer bit life and less torque. Crews especially liked the way that DRILLING MILK gave them easy control and maintenance of mud. Several of Northwest Production Corporation's other wells in the San Juan Basin have used DRILLING MILK with similar excellent results.

Arapahoe Drilling Co.'s Rig No. 2 is shown here drilling for Northwest Production Corp. in the Mesa Verde formation in La Plata County, Colorado. At right is Cheyenne Johnson, toolpusher.

LOOK FOR THE AQUANESS SEAL

. . . it identifies the original high speed drilling fluid emulsifier, made by Aquaness to highest standards of uniformity for leading mud companies.

ATLAS

Aquaness *Department*

ATLAS POWDER COMPANY

2005 Quitman Street, Houston 26, Texas

The Aquaness seal is your assurance of uniform, top quality products for the petroleum industry.

"Those WECO UNIONS can really take it!"

Watch a rig worker make-up or break-out a Weco and you will be convinced that here is a union that never needs pampering. For Weco Unions are built with extra strength to take the extraordinary service required in drilling an oil well.

But that's only half of the story. Even after repeated make-up on location after location, Weco's ball and cone seat maintains a perfect, leak-proof seal.

This ability to successfully take the toughest treatment results in better, longer union service at less cost . . . best reasons in the world to insist on Weco Unions . . . available at supply stores everywhere.

U-6-56

WECO®

WELL EQUIPMENT MFG. CORP.
HOUSTON, TEXAS

Division of CHIKSAN COMPANY *a subsidiary of*
FOOD MACHINERY AND CHEMICAL CORPORATION

In JENKINS Monel-seated Bronze Gates

THE WEDGE TAKES THE WEAR - *and spares the rings*

Easy replacement of the wedge only — right on the line — restores full efficiency

THE MONEL SEAT RINGS are expanded into the body to assure a positive, leak-proof joint. Exhaustive tests in typical monel-seated gate valve services show that this permanent all-around support of the rings is essential to guard against deforming, loosening, or shifting.

THE RENEWABLE WEDGE (bronze or nickel alloy) has excellent wear resistance, but has a lower degree of hardness than the heat-treated Monel rings, which have optimum resistance to erosion and corrosion as well as abrasion. Thus, wear of the wedge leaves the rings relatively unaffected. When necessary to renew the wedge, you simply remove the valve bonnet, slip the old wedge off the stem, and slip on a new one.

GET PRACTICAL, LOW-COST RENEWABILITY in the valves you choose for the tough, punishing services that require Monel-seated gates. Compare . . . there is nothing simpler, faster, or more economical than Jenkins replaceable wedge design — and you also get the *plus* of Jenkins *extra value* in every other feature. Jenkins Bros., 100 Park Ave., New York 17, New York.

MADE WITH BRONZE OR NICKEL ALLOY WEDGE

The bronze wedge provides lasting economy for most applications. The nickel alloy wedge provides extra resistance where rapid wear and corrosion are factors.

JENKINS BRONZE GATES WITH MONEL SEAT RINGS

200 psi	300 psi
Fig. 270-U, Bronze Wedge	Fig. 280-U, Bronze Wedge
Fig. 270-UN, Nickel Alloy Wedge	Fig. 280-UN, Nickel Alloy Wedge
Fig. 270-UL, Bronze Wedge, U.L. approved for L.P.G. Services	350 psi Fig. 280-UX, Bronze Wedge

JENKINS BRONZE GATES INCLUDE 40 DIFFERENT PATTERNS

125 • 150 • 200 • 300 • 350 psi SOLID WEDGE • SPLIT WEDGE
SCREWED • FLANGED • SOLDER END • SOCKET END QUICK OPENING

Call your local Jenkins Valve Distributor for complete information.

JENKINS VALVES

LOOK FOR THE JENKINS DIAMOND

SINCE 1864 TRADE JENKINS MARK

Jenkins Bros.

The best services of two companies

BJ SERVICE

Chemical Process

Now you can benefit from the combined knowledge and experience... the *best* equipment and services... of *two* great oil well service companies. This newly-formed combination of BJ Service-Chemical Process means faster, better results for you.

OIL WELL CEMENTING

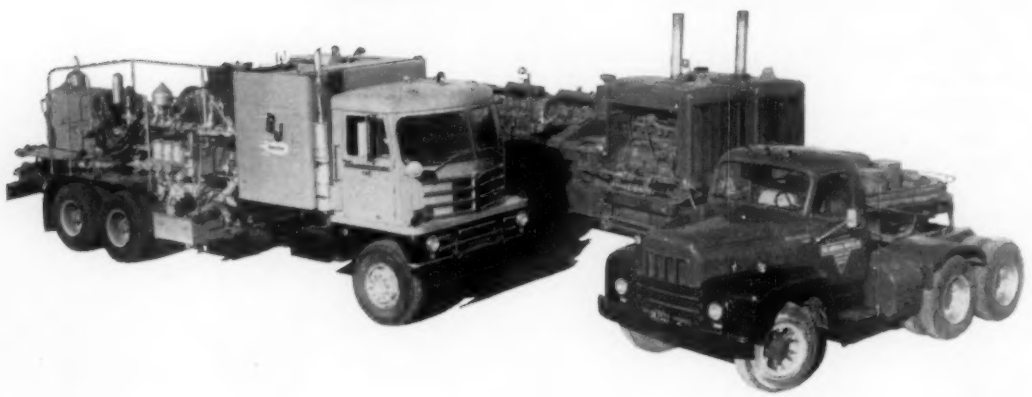
ACIDIZING
Each job engineered to assure maximum results.

AQUAFREE
A service employing the latest techniques in water block removal.

RADIOACTIVITY LOGGING

GEOFRAC
Emulsified acid-in-kerosene fracturing fluid.

FRAC-ASSIST TOOL
A 5000 hydraulic horsepower down-hole booster for multiple fracturing.



are now combined for your benefit!

AQUAFRAC
Gelled or ungelled water fracturing service.

SELECT-O-BALL
Selective multiple fracturing technique.

JET AND BULLET PERFORATING

WALL-HOLD
Plastic-coated walnut shell service for sand control.

MUD-SOL
Three distinct mud removal services.

PERMETER SERVICES
Permeability metering, open hole caliper service and controlled acid treatment.

VISQUEEZ
A new and superior method for shutting off water.

CPN
Emulsion block removal service.

OILFRAC
Unemulsified or ungelled sand-oil service.

T-O FRAC
Gelled, or thickened oil, fracturing service.

FORMJEL
Within-formation temporary blocking agent.

For additional information on these services contact your nearby BJ Service-Chemical Process field station

CHEMICAL PROCESS BJ Service

SUBSIDIARY OF BORG-WARNER CORP.

BJ SERVICE, INC.

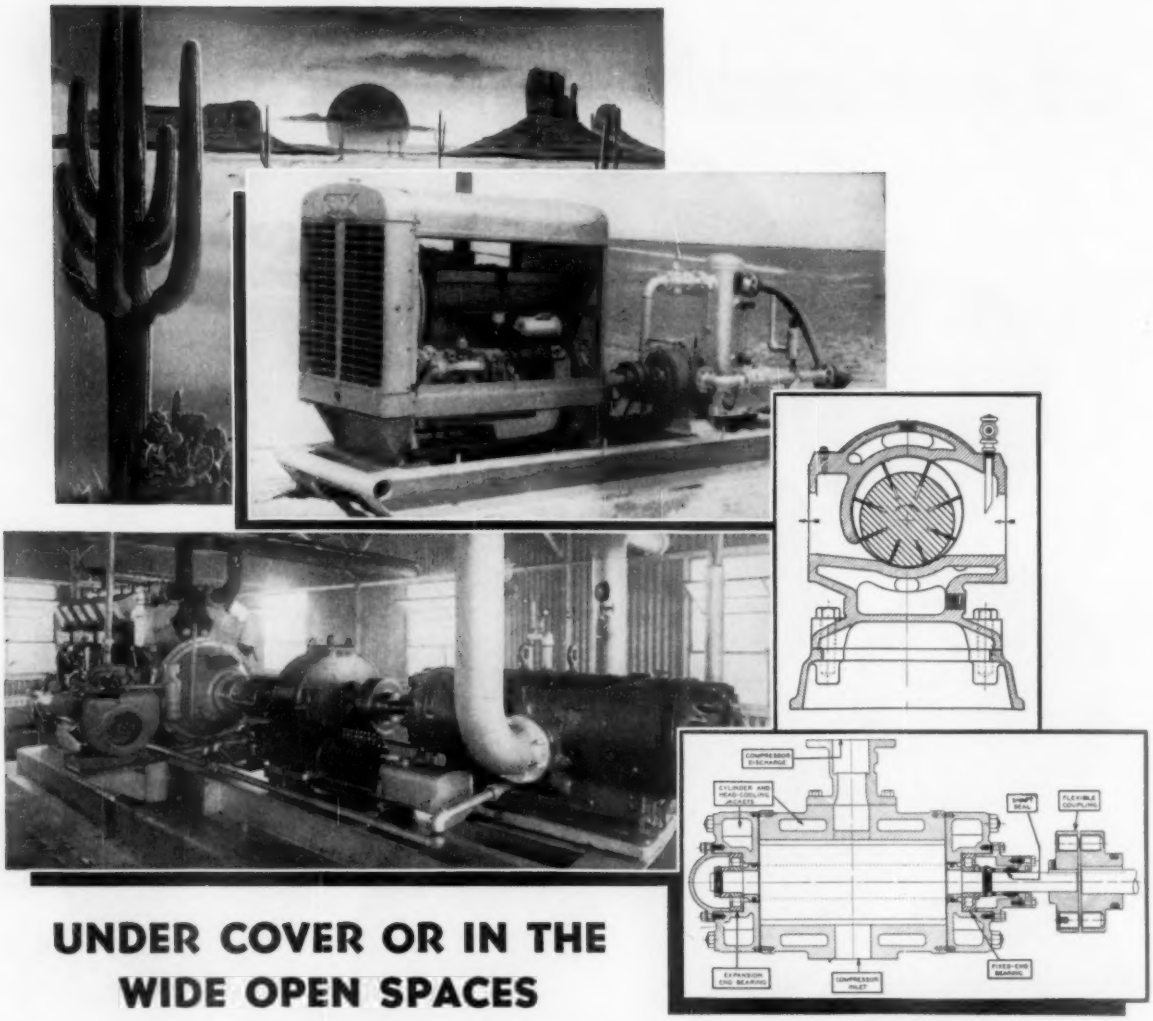
General Offices and Laboratory—Long Beach, California

Stations Throughout California, Rocky Mountain and Permian Basin Areas

Chemical Process

General Offices and Laboratory—Breckenridge, Texas

Stations Throughout the Mid-Continent Area



UNDER COVER OR IN THE WIDE OPEN SPACES

. . . Fuller Rotary Compressors do a very big job

It's a job that, more and more, is being multiplied throughout the entire petroleum industry. For trouble-free gas gathering and boosting, as well as refinery gas recirculation, the Fuller Rotary Compressor has gained a wide acceptance.

Compactness, ease of installation, economy and versatility feature the Fuller Rotary packaged unit. In operation, the complete elimination of compressor valves, crankshafts, pistons and numerous other moving parts considerably brightens the problems of maintenance, and replacement. Metering problems and pressure fluctuations are reduced to zero because of pulsation-free flow due to rotary compression. Blades are held out by centrifugal force, compensating for wear, thus maintaining capacity for the life of the machine. Fuller's rotary principle is completely free of reciprocating parts, thus avoiding the basic cause of vibrations.

There are other eminently practical qualities, too, all of which are fully described in our literature, along with sizes and installation examples. We'd like you to have a copy. All you need do is ask for it.

FULLER COMPANY
GENERAL AMERICAN
TRADE MARK

C-286
2029

FULLER COMPANY
132 Bridge St., Catasauqua, Pa.
A SUBSIDIARY OF GENERAL AMERICAN TRANSPORTATION CORP.
Chicago • San Francisco • Los Angeles • Seattle • Kansas City • Birmingham

PIONEERS OF HIGH-EFFICIENCY VANE TYPE ROTARY COMPRESSORS SINCE 1930

Working storage tank at Cromwell, Okla., is pumping or receiving 80 per cent of the time, has a throughput of 2,500,000 bbl. per year. It handles select crude and mixed crude-casinghead gasoline. It is owned by Mid-Continent Pipe Line Co., subsidiary of D-X Sunray Oil Co.

Still cutting evaporation loss after two years

with Microballoon spheres*

Two years ago, D-X Sunray Oil Co. equipped this 35,000-bbl. cone-roofed tank with "Microballoon" spheres made from BAKELITE Brand Phenolic Resins. Since that time, this vapor-stopping blanket has reduced evaporation loss an estimated 70 to 80 per cent according to D-X Sunray.

Installing the spheres took eight men about three hours. Within 24 hours, the "Microballoon" spheres had formed a blanket spread over the entire oil surface. Today, this foam seal is still effective after some 5,000,000 bbl. of oil have been pumped through the tank.

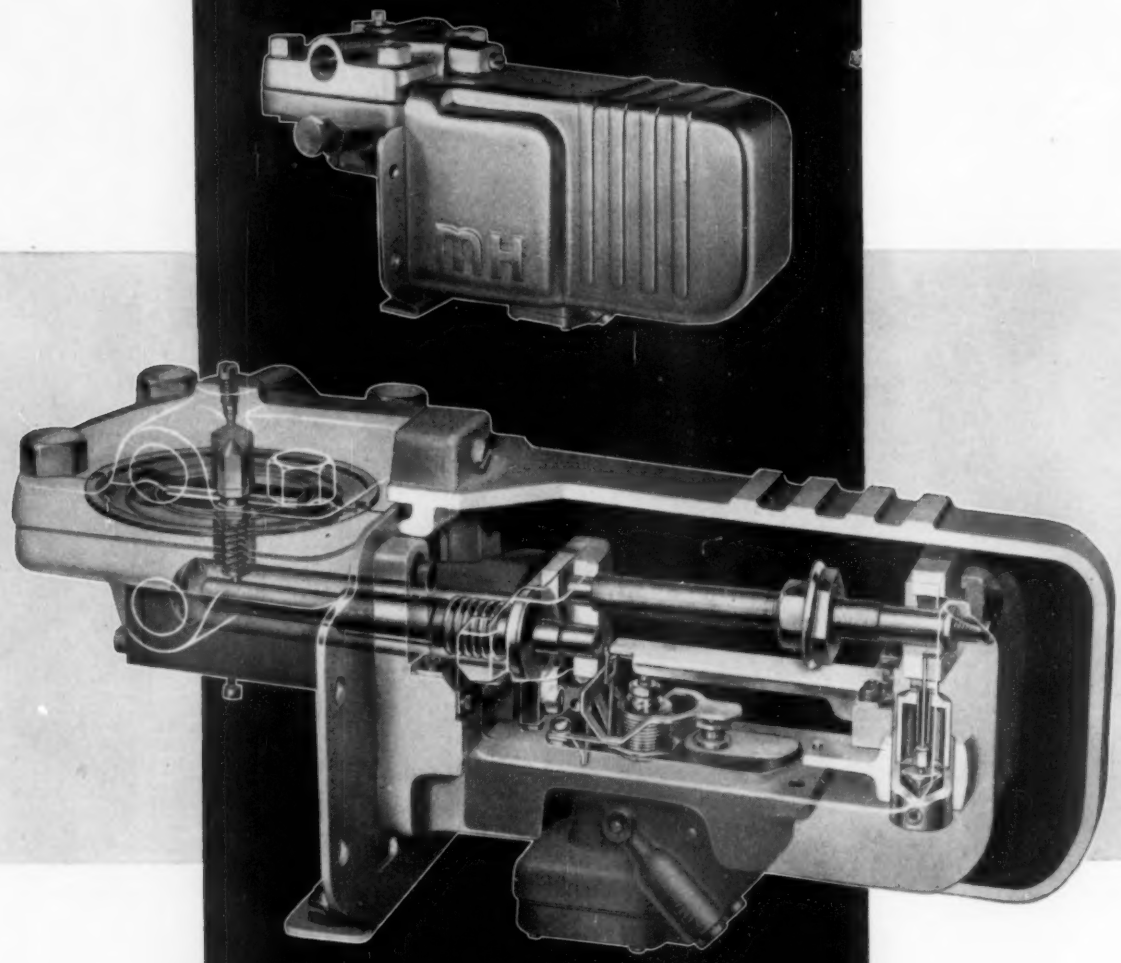
These results indicate the economy and effectiveness of this method of evaporation control. To learn more about it, write today to Department **VL-128.**

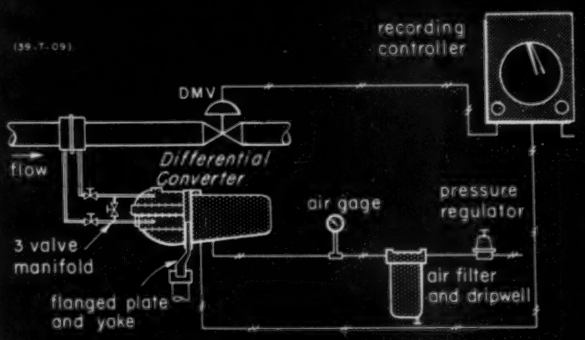
*Registered trade-mark of The Standard Oil Co. (Ohio)

for evaporation control . . .

BAKELITE BRAND **RESINS**

BAKELITE COMPANY, *A Division of Union Carbide and Carbon Corporation* UCC 30 East 42nd Street, New York 17, N. Y.
In Canada: Bakelite Company, Division of Union Carbide Canada Limited, Belleville, Ontario
The term BAKELITE and the Trefoil Symbol are registered trade-marks of UCC.





Locally mounted transmitter can be connected to recording (or indicating) controller, which can be near orifice or at remote location. Recorder without control can be located up to 1,000 feet from transmitter.

Closer Control of Flow and Liquid Level

...with Honeywell's Differential Converter

USE THIS mercuryless remote transmitter for practically *any* application requiring precise, high-speed measurement of flow or liquid level. It's accurate within 1%. Equally fast in response up the scale or down. Range is continually adjustable in the field. Mount this compact, lightweight unit anywhere.

The *Differential Converter* operates on the force-balance principle, transmitting by a single air line to a pneumatic receiver as far as 1,000 feet away. It's the ideal companion for Honeywell *Tel-O-Set* miniature recorders, indicators and controllers.

For details on how *Differential Converters* make possible tighter control in your most critical applications, call your nearby Honeywell sales engineer today. He's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.—in Canada, Toronto 17, Ontario.

For measuring liquid level in closed tanks: One model with a normal range of 0-14 to 0-200 inches of water, and two suppression ranges of 0-75 and 50-200 inches. Suppression spring permits direct, instead of reverse, reading of instrument.

For measuring flow and liquid level in open tanks: Two models with ranges from 0-20 to 0-200 inches of water differential and 0-100 to 0-1000 inches.

● **REFERENCE DATA:** Write for Bulletin 2290-1, "*Differential Converter* Liquid Level Transmitter"; Catalog 2321 "Flow Meters"; and Specification 248, "*Differential Converter* Flow Transmitter".

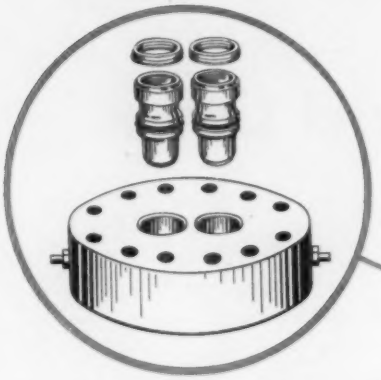
MINNEAPOLIS **Honeywell**

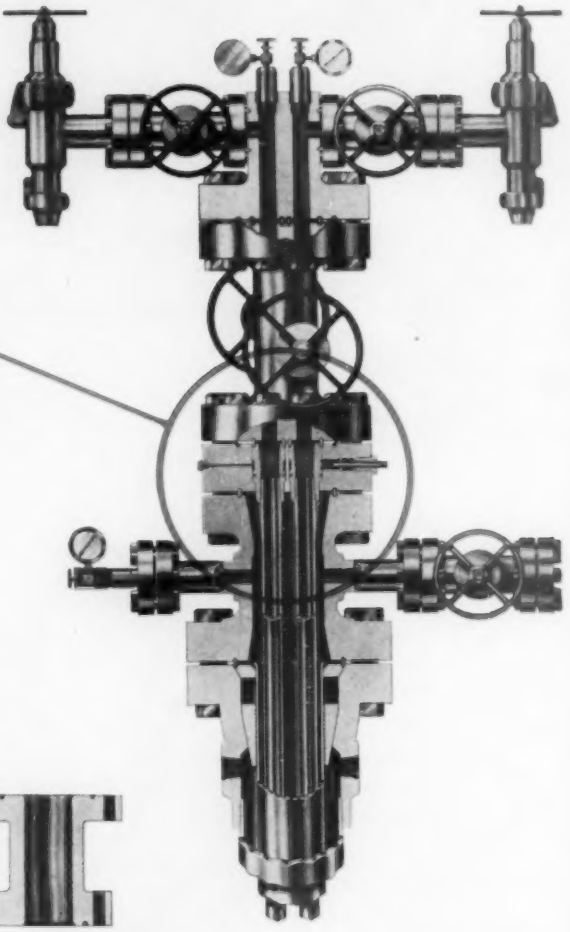
BROWN INSTRUMENTS

First in Controls

RECTOR Dual-String Hanger Flange

Outstanding Simplicity and Flexibility, plus the FAMOUS Rector Metal-to-Metal Seal





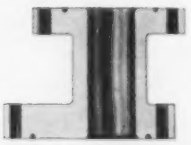
SIMPLICITY: The flange has two full opening tapered bores in which the strings are suspended by threaded mandrels. This eliminates mating and sealing two tubing hangers in a single, large bore. Each string can be suspended, temporarily sealed, and held down independently of the other assuring maximum ease of installation with complete control of well.

FLEXIBILITY: Regular 2" API upset tubing can be run or pulled through the bores in the flange.

METAL-to-METAL SEALS: Each mandrel is independently sealed by a metal seal ring in the groove at the junction of mandrel and flange. This metal-to-metal sealing arrangement also acts as a hold-down. "O" Rings on the mandrel provide a temporary seal during completion and permit testing the seal after Christmas Tree is installed. Mandrels are grooved for hold-down locking screws, which are optional in the flange.

• **Rector Dual-String Hanger Flanges are available in Nom 6 and Nom 8 sizes in any series. Mandrels are interchangeable.**

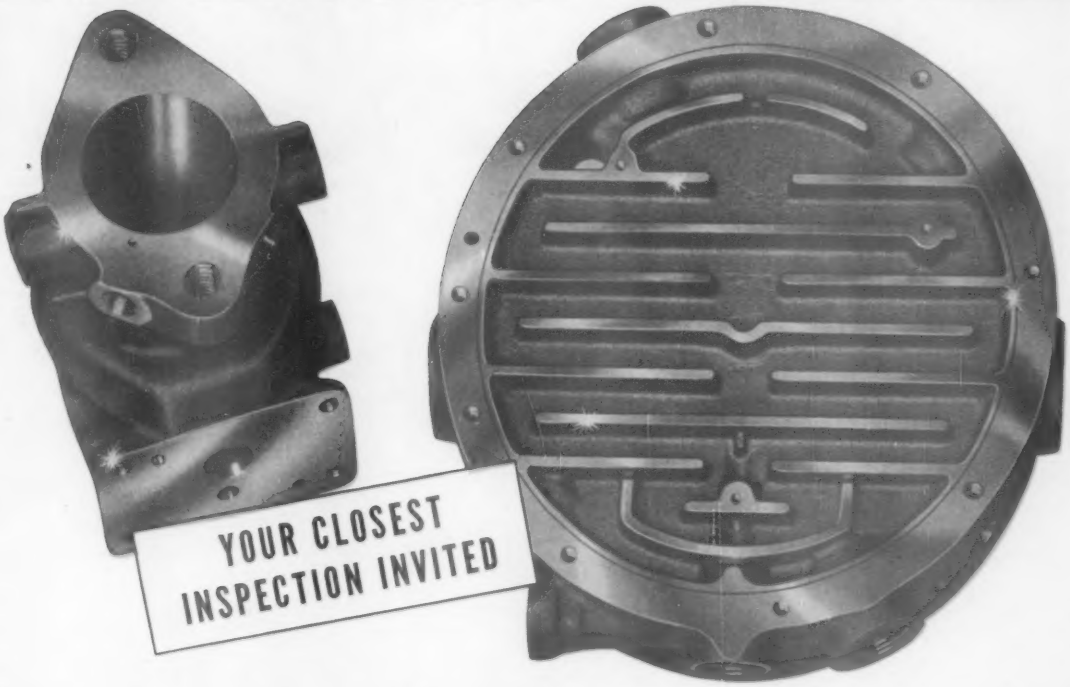
For maximum simplicity and flexibility of dual-string suspension, plus the metal-to-metal seal that never requires maintenance or replacement, specify a Rector Dual-String Hanger Flange in your dual completion Christmas Tree.



Off-Set Adapter Spool permits use of regular preventer equipment with alignment directly over each individual bore while running and pulling tubing. After first string is run, Adapter Spool can be rotated to center directly over the other bore.

RECTOR WELL EQUIPMENT COMPANY INC
★ MAKING THE OIL INDUSTRY SAFER
1100 NORTH COMMERCE ST. FORT WORTH, TEXAS
Houston Plant: 2215 Commerce St.
REPRESENTATIVES IN ALL ACTIVE FIELDS

ENSIGN WORKMANSHIP BUILDS STRONG USER PREFERENCE



Bronze alloy castings precision machined assure dependable carburetion

Everybody appreciates quality. In LP-Gas carburetion it's especially important. Ensign vaporizers built of bronze alloy castings cost more to produce but are practically corrosive resistant and outlast others by many years.

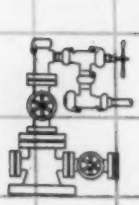
After machining, Ensign bronze castings "HOLD THEIR SHAPE" against distortion of mounting screws etc. thereby eliminating gasket and water leaks. There is no question about it—it costs more to produce an Ensign Vaporizer, Carburetor or Filter of bronze alloy, yet the selling price is frequently less because we produce thousands at a time for distribution all over the world.

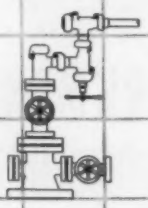
Examine an Ensign product — compare it in any way. It looks like quality — it is quality! Insist on Ensign — accept nothing less!

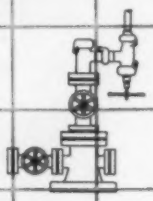
ENSIGN CARBURETOR COMPANY

1551 EAST ORANGETHORPE AVENUE • FULLERTON, CALIFORNIA

BRANCH FACTORY, 2330 WEST 58th STREET, CHICAGO 36, ILLINOIS





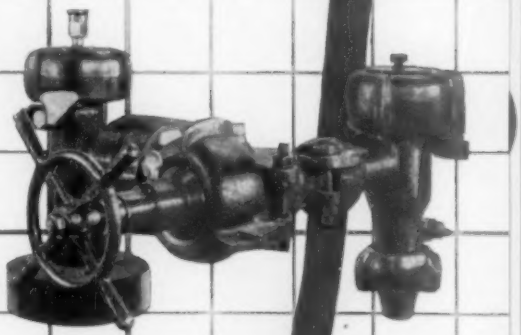


UNIBOLT
flow manifolds

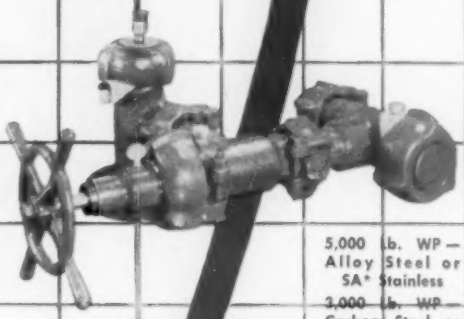
fit your pressures as well as your pocketbook

These are the Christmas tree manifolds that are custom-built to any operator's flow control needs, but at no premium in price. Unlike manifolds of fixed design, UNIBOLT permits complete flexibility in arrangement of its units. Components may have threaded, flanged or UNIBOLT connections. They may be of malleable, regular steel, alloy or SA* stainless, depending upon pressures and service. The chokes may be adjustable or positive with interchangeable flow-rated beans or X-beans. Tee type for single wing or cross type for double wing trees are available. Select exactly what you need for the well. Later on you may salvage the entire manifold as a unit or as individual parts for use elsewhere. By any yardstick, UNIBOLT Flow Manifolds give you far more desirable features . . . at a reasonable cost.

*Special Analysis

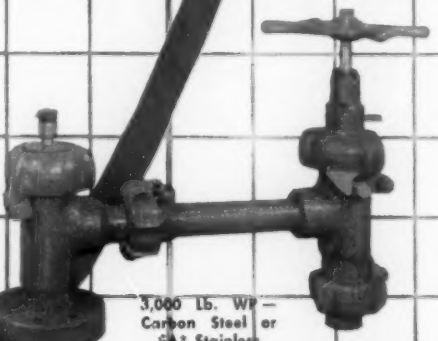


10,000 Lb. WP — Alloy Steel or SA* Stainless



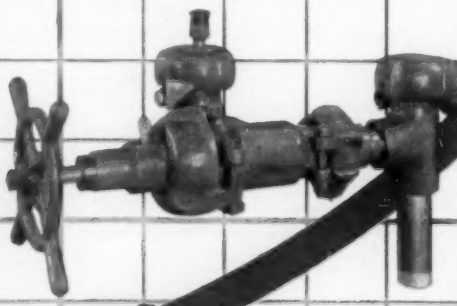
5,000 Lb. WP — Alloy Steel or SA* Stainless

3,000 Lb. WP — Carbon Steel or SA* Stainless



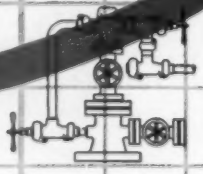
3,000 Lb. WP — Carbon Steel or SA* Stainless

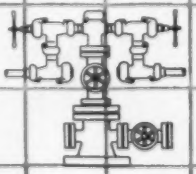
5,000 Lb. WP — Alloy Steel or SA* Stainless

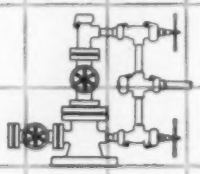


3,000 Lb. WP — Carbon Steel or SA* Stainless

5,000 Lb. WP — Alloy Steel or SA* Stainless







THORNHILL P. O. BOX 1184

CRAVER CO. HOUSTON, TEXAS

SHIPPING CRUDE OIL TO EUROPE?

TRETOLITE FEP-95 conditions oil in transit

1. **Prevents contamination by residual ballast water.**
2. **Demulsifies residual B. S. & W. content in crude.**

The Suez situation now makes it necessary for European refineries, designed to process low-salt Middle East crudes, to handle a variety of crudes, some of which may contain harmful quantities of salt in the B. S. & W. Tretolite FEP-95 makes it possible to treat the oil in transit, preventing sea water contamination from residual ballast, and taking advantage of ship motion agitation further to separate the normal B. S. & W. from the crude.

FEP-95 has a long record of successful commercial applications in fuel oil transportation service by preventing fuel oil–sea water emulsification often caused by the presence of residual ballast water. It has also been used effectively as a desalting agent.

Note: If conditions prevent treatment in transit, Tretolite FEP-95 can be injected into the crude as the tankers discharge cargo at destination. The FEP-95 treats the crude as it is pumped into the tanks; the free water settles out during storage.

Care should be exercised with transit-treated cargoes to make sure that the separated water and B. S. & W. are not re-mixed with the cargo during unloading.

TRETOLITE COMPANY

A DIVISION OF PETROLITE CORPORATION

369 Marshall Avenue, St. Louis 19, Mo.
5515 Telegraph Road, Los Angeles 22, Calif.

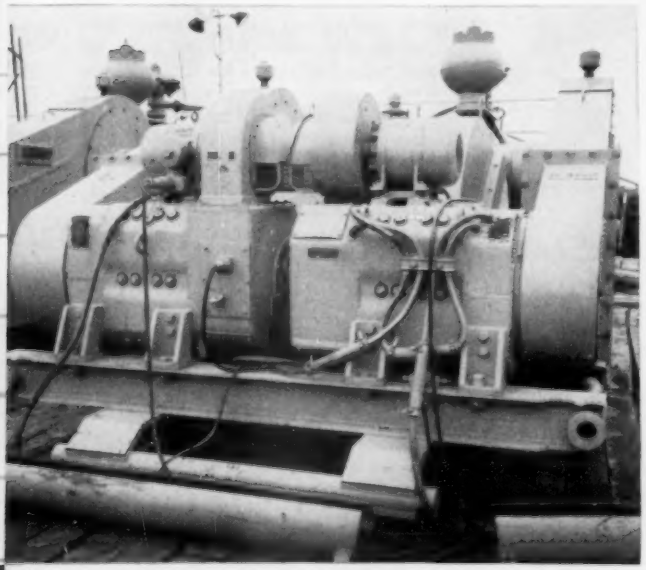
For further information write or call

Chemicals and Services for the Petroleum Industry

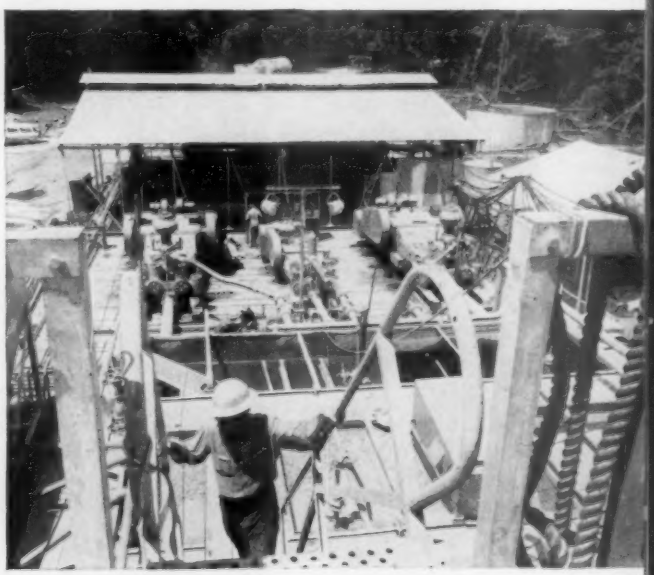
DESALTING • DEMULSIFYING • CORROSION INHIBITING • SCALE PREVENTING • FUEL OIL ADDITIVES • WATER DE-OILING • METAL DEACTIVATORS

FEP-57-2

Three skid-mounted Electro-Motive Diesel generating sets rated at 875-hp. supply power for motor driven pumps, rotary table and draw works. Each unit is complete with two 500-kw generators, controls and cooling system.



Drive motors are 625-hp. direct current type for smooth, rapid acceleration of loads and positive control of speed and torque. Each main pump has two 625-hp. motors for a total horsepower rating of 1,250.



Simple, flexible conductors connect generating sets to drive motors, allowing complete flexibility of arrangement. Rig-up time is reduced considerably because components are located to fit the site.

It's Diesel-Electric for Shell on Cote Blanche Island

Portable, rapid-setup Electro-Motive Power choice for big rig in rugged Louisiana swamp

To work the swampy Cote Blanche Island field, Shell Oil Company faced two opposing requirements for their Rig 11. First, the rig had to be big, with power to drill over 18,000 feet. And second, it had to be easily portable to enable movement over primitive roads.

Shell's decision to use Diesel-Electric was influenced by the fact that this type power permits gathering almost all equipment into easy-handling, skid-mounted packages. In spite of rough terrain, rig-up can be completed in record time.

Electric conductors running from generating units to drive motors provide flexibility in locating equipment to suit conditions. This design avoids clutter, reduces rig-up and rig-down time and makes a big rig far more economical to move. Also, with few modifications, equipment can be adapted for offshore drilling.

Three Electro-Motive SR-8, 875-hp. Diesel generating units driving nine 625-hp. d.c. motors provide the drilling power for Rig 11. Its first hole is scheduled for 18,500 feet, using a 14,000 foot, 9⅝ in. protective string. It takes big power to drill below the overhang of the salt dome in this area, and this rig has it.

Electro-Motive Power is adaptable to many different types of drilling devices on land or water. For complete details on how it might fit your own particular requirements, get in touch with your Electro-Motive representative.

ELECTRO-MOTIVE DIVISION · GENERAL MOTORS

LA GRANGE, ILLINOIS *In Canada:* General Motors Diesel Limited, London, Ontario

Petroleum industry sales offices: Tulsa, Oklahoma; Houston, Texas; Dallas, Texas; Morgan City, Louisiana; Pasadena, California.

Driller's control is located next to draw works. From a central position, driller has complete control of Diesel-Electric equipment, including engine speed, pumps, hoist, rotary table and safety shutdown.

Derrick on Rig 11 is a big one—147 feet. It was modified for platform drilling, but can be extended to 189 feet. In spite of size, the rig is highly portable. Skid-mounted equipment gathers into easy-handling packages.

This man helps move 175 carloads of caustic at a time

(He's a deck officer on the Marine Dow-Chem)

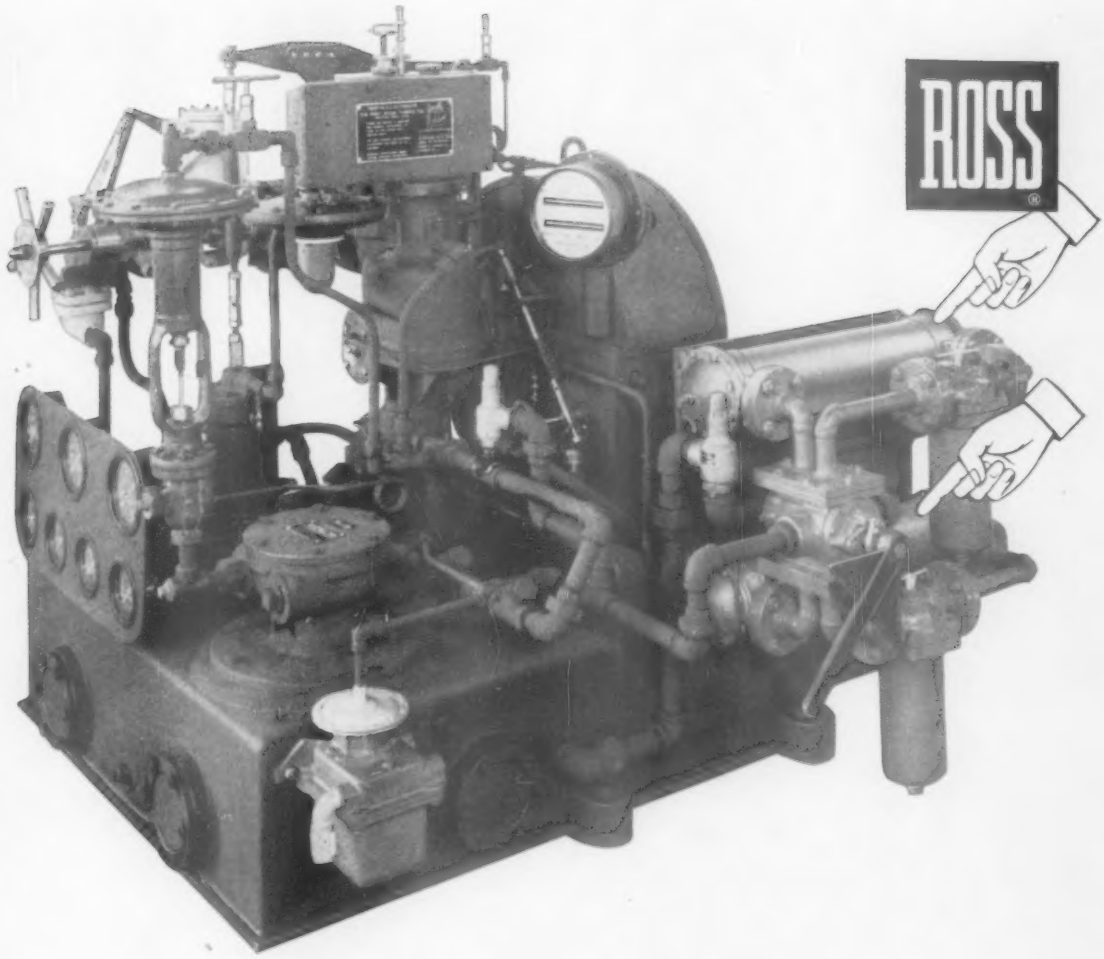
After a few terse commands from the bridge, the 18,000-ton *Marine Dow-Chem* glides silently into the night.

With her cargo of vital chemicals the *Dow-Chem* plies her way to key Dow terminals. In her storage tanks there is enough caustic soda to fill 175 tank cars.

Typical of the foresighted Dow attitude of solving a problem before it arises, the *Dow-Chem* was commissioned in 1954 with an eye to the future needs of industry. Today, this specially equipped ship is an important part of our vast distribution system.

As demand increases, Dow will continue to lead the way in developing new methods to deliver caustic soda to your doorstep in any form or quantity. THE DOW CHEMICAL COMPANY, Midland, Mich., Dept. AL 600D.

YOU CAN DEPEND ON DOW



dependable ROSS EXCHANGERS assure temperature-safe lubrication of this Terry Turbine

Rated 450 hp at 7450 rpm, this single-stage Terry Steam Turbine drives a centrifugal compressor in a refinery.

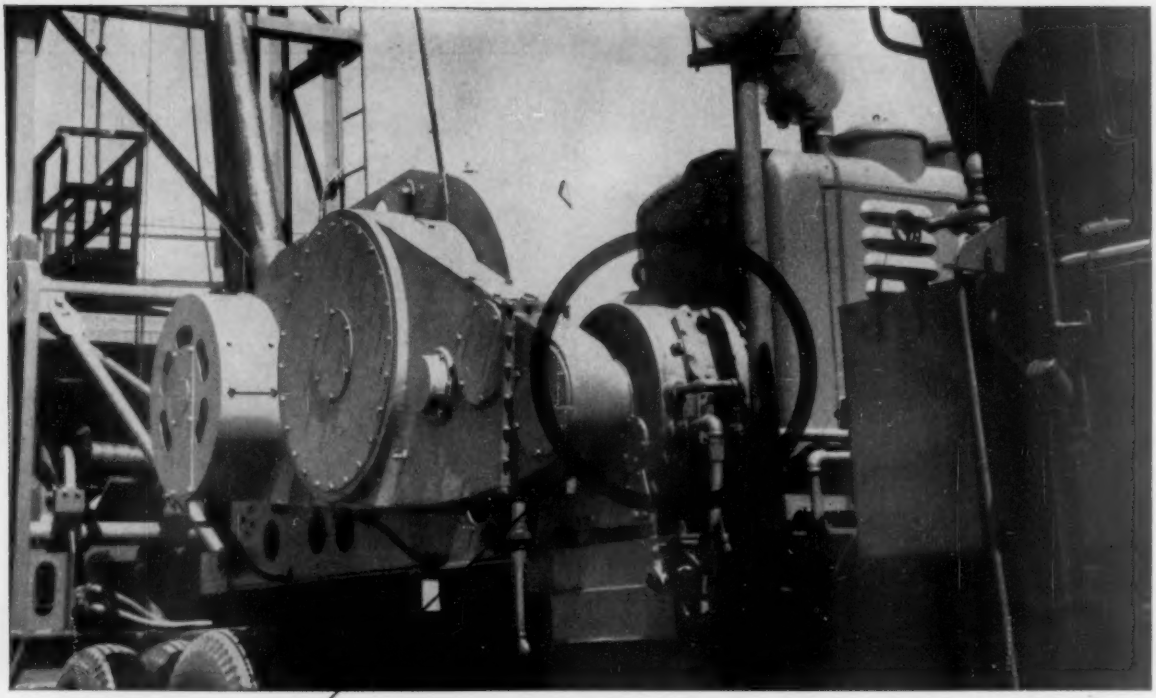
To maintain continuous, trouble-free performance, two Ross Type BCF Exchangers have been installed as original components in its lubrication system. Excessive heat is dissipated, and correct lube oil viscosity maintained. The main journal, thrust bearings and governor receive their full share of properly cooled oil at all times.

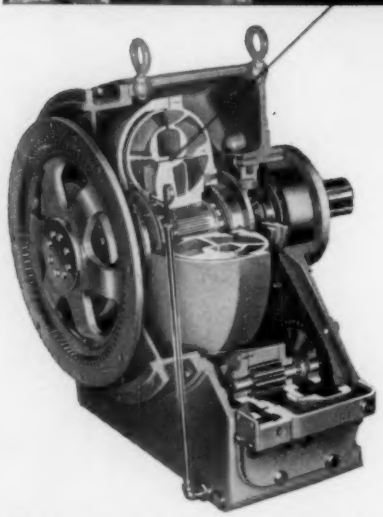
Because of their high thermal efficiency, Ross Exchangers safeguard numerous types and makes of machinery serving the oil and gas industry: compressors, turbines, engines, blowers, reduction gears, centrifugal pumps, torque converters and fluid drives. Rugged and compact, they're easy to install, easy to maintain.

Completely pre-engineered and fully standardized, Ross Exchangers are available in a wide range of sizes to meet your heat transfer requirements. Learn what these non-ferrous units can do for you by requesting Bulletin 1.1K5. Ross Heat Exchanger Division of American-Standard, Buffalo 5, N. Y. In Canada: American-Standard Products (Canada) Limited, Toronto 5, Ont.

ROSS HEAT EXCHANGER

Division of AMERICAN - Standard





How to make that engine deliver MORE WORK with LESS WEAR

CLARK Torque Converter

This you can depend on: any power plant, mobile or stationary, equipped with a Clark Torque Converter, will accomplish *more work with less wear.*

Smooth, shockless power-flow eliminates shock-loads, reduces wear of all working parts in the engine and in the power train. Result: less down-time, less maintenance, steady high efficiency through a longer, more useful life.

Take special note of these Quality Features

- **True Hydra-Foil Blade Design**—blade contour and angle assure maximum efficiency in torque multiplication
- **No Cavitation**—proper oil flow prevents turbulence and formation of air pockets, major causes of efficiency loss
- **High Engine Efficiency**—engine operates at its most efficient speed under varying torque demand
- **Self-Contained Oil Circuit**—sump cast integral; oil passages cored in housing. No hoses or unnecessary fittings—no external oil seals
- **Ideal Accessibility**—easiest inspection and maintenance. No special tools required
- **Size for Every Need**—horsepower 15 to 600; diameters 11 in. to 26 in.

Helpful literature sent promptly—use the coupon

CLARK® EQUIPMENT

CLARK EQUIPMENT COMPANY, Falahee Road, Jackson 15, Mich.: Please send the CLARK Torque Converter Bulletin

Name_____ Position_____

Firm_____ Address_____

City_____ Zone_____ State_____

Keep areas weed-free . . . avoid fire hazards

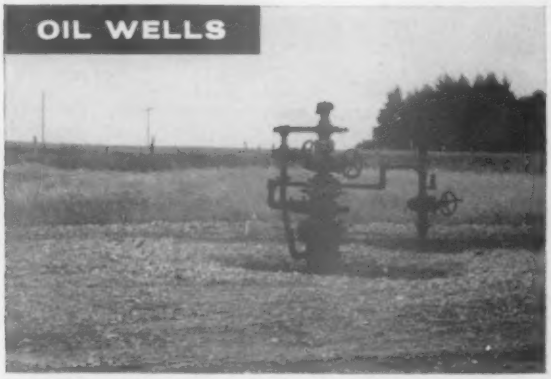
Spray Du Pont TELVAR® WEED KILLERS just once for season-long weed control

You can eliminate weeds and grasses that create fire hazards and that make maintenance difficult and costly. Just one spray of Du Pont "Telvar" controls weeds for a season or longer. "Telvar" kills weeds through the roots, then remains in the soil to provide residual action long after the initial spray is applied. Low dosages save you cost, handling and storage space. "Telvar" weed killers are non-corrosive to equipment, non-volatile, low in toxicity to humans and animals. For low-cost, long-term control of weeds, include "Telvar" in your maintenance program.

TELVAR®
Monuron and Diuron
WEED KILLERS

DU PONT
REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY



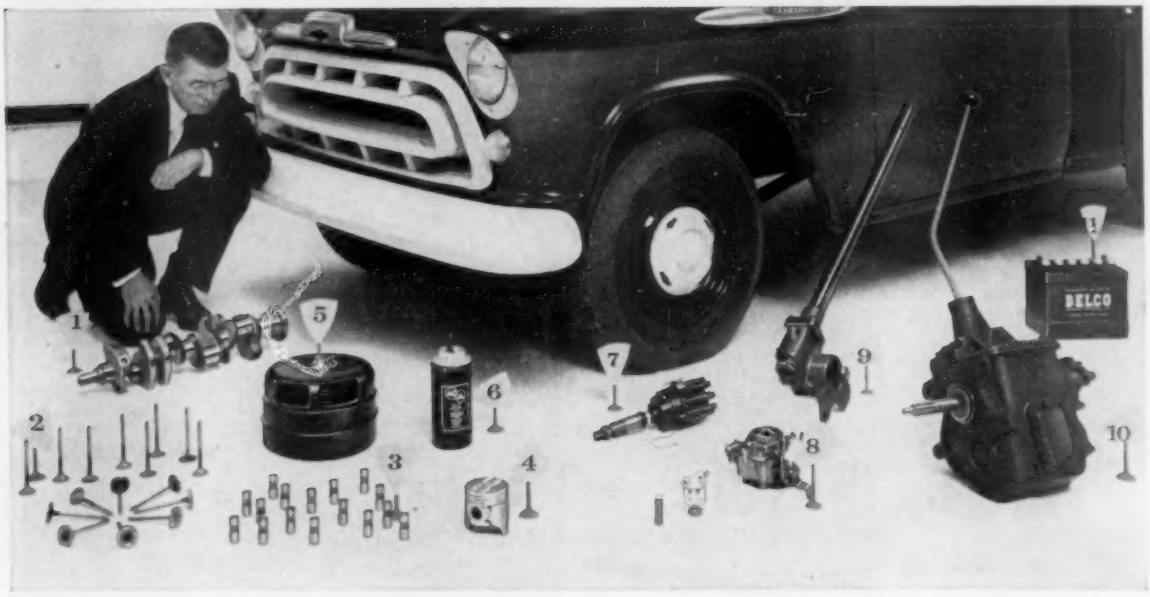
Note the excellent control of weeds and grasses around this wellhead from just one application of "Telvar."

The treated area around this tank farm has remained weed-free for an entire season.

Along these pipelines, where maintenance is tough, one application of "Telvar" has kept the treated area weed-free for a year.

On all chemicals, follow label instructions and warnings carefully.

LOW HAULING COSTS COME RIGHT FROM THE "HEART" OF A '57 CHEVY



Many of the things that make a Chevrolet truck more economical to run are seldom seen by the owner. They're hidden features, deep in the truck's design. Here are just a few of them, to prove a Chevy's engineered better and built better for bigger savings!

1. *Forged steel crankshaft*—It's extra sturdy, precision machined and balanced, the foundation for dependable, long-lasting power!

2. *Aldipped exhaust valves**—Special aluminum treatment on valve surface protects valves against pitting; engine wears less, costs you less to run!

3. *Hydraulic valve lifters*—for longer valve life in V8's, fewer engine repair jobs.

4. *Chevy V8 piston*—Thanks to *short-stroke* V8 engine design, this piston travels a shorter distance, wears less. Short-stroke efficiency aids fuel economy, too!

5. *Oil-bath air cleaner*—*standard* on all Chevrolet truck engines for added protection against dust and foreign matter that shorten engine life.

6. *High-capacity oil filters***—They remove dirt particles from Chevy engine oil to cut engine wear and maintenance.

7. *Easy-adjust distributor points*—You can adjust this new Chevy V8 distributor *with the engine running*; it's added insurance against costly down time.

8. *Multiple fuel filters*—For *clean* fuel, all Chevy engines have fuel filters in the carburetor and fuel tank; in addition, V8's provide an *extra* filter at the carburetor.

9. *Ball-Gear steering mechanism*—Inside this steering gear scores of polished steel balls virtually eliminate friction. Less friction means less wear, less maintenance!

10. *Rugged manual transmission*—Synchro-Mesh design eliminates the need for double-clutching, reduces costly wear. Gears are shot-peened for extra strength.

11. *12-volt battery*—provides sure starting, good ignition, long battery life in all Chevrolet trucks.

And there are many more! See your Chevrolet dealer for all the dollar-saving facts. . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

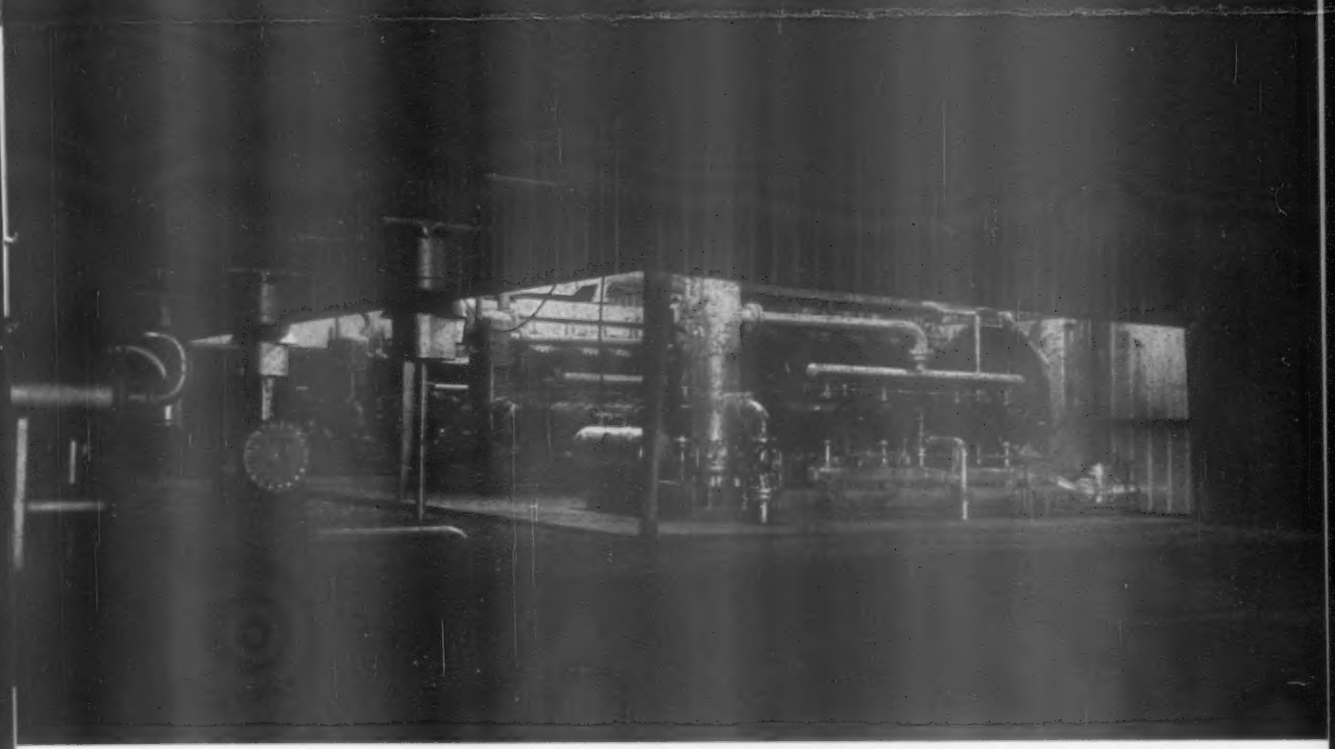
**On Thriftmaster 6, Trademaster V8.*
***Standard on V8's and Jobmaster, optional on Thriftmaster 6.*

1957 CHEVROLET TASK·FORCE TRUCKS

PROVED ON THE ALCAN HIGHWAY . . . CHAMPS OF EVERY WEIGHT CLASS! CHEVROLET

BEAIRD-INGERSOLL-RAND
Packaged Compressor Plant

Lowest Cost Per Horsepower Installed



NATURAL GAS AND OIL COMPANY'S SLIGO FIELD STATION—equipped with three Beaird-Ingersoll-Rand 10SVG 550 h.p. packaged compressors, Young Radiators with lubricating oil coolers, gas coolers and all necessary controls. Other sizes 110 to 660 h.p.

Natural Gas and Oil Company has twice expanded this compressor station in Sligo Field, Louisiana. Originally it was equipped with a single Beaird-Ingersoll-Rand 10SVG 550 h.p. compressor. In designing the station the engineers provided the space and piping to accommodate units that would be added on as needed. Now picking up gas from 24 low pressure wells at 650 psig. the station is boosting from 40 mmcfd to 50 mmcfd to transmission lines at 1050 psig. The last unit installed in August of this year will enable the station to follow the pressure on down to 200 psig. without change from single-stage operation. At this point in production the units will be changed in the field to two-stage operation. And finally as the field nears depletion, one or two of the compressor plants may be transferred as a complete package to another site, leaving the remaining plant to complete production.

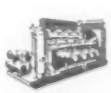
Let us show you the versatility possible with packaged compressors designed for your production needs.

Versatile Packaged Compressors–

SOLUTION FOR EXPANDING STATION

BEAIRD MACHINING MANUFACTURING STEEL WAREHOUSE

THE J. B. BEAIRD COMPANY, INC.


PACKAGED COMPRESSOR PLANTS

CAST STEEL FITTINGS

PRESSURE BULK STORAGE

ANHYDROUS AMMONIA EQUIPMENT

LP-GAS SYSTEMS

SHREVEPORT, LOUISIANA • Sales Offices: *Dallas, Houston, Corpus Christi and Midland, Texas* • *New Orleans, Louisiana* • *Tulsa, Oklahoma* • *Denver, Colorado* • *Los Angeles, California, and Cie. Ingersoll-Rand, Paris, France*

BEAIRD FITTINGS...

THE RIGHT TURN FOR SEAGOING OIL!

Weighing twenty six hundred pounds each, these 24″ Beaird cast steel fittings have gone to work delivering Venezuelan oil to waiting tankers. Another example of precision manufacturing from blueprint to finished product, the big cast steel flanged elbow fittings were produced to exacting specifications by Beaird's machining division. One of five divisions serving the oil, gas, petro-chemical and construction industries, the machining division offers its customers the benefits of the integrated facilities and know-how of the entire Beaird production team.

BEAIRD

Let us quote on your next outside machining or special product requirement. Write: The J. B. Beaird Company, Inc., Shreveport, Louisiana.

THE J. B. BEAIRD COMPANY, INC.

MACHINING
MANUFACTURING
STEEL WAREHOUSE

PACKAGED COMPRESSOR PLANTS

CAST STEEL FITTINGS

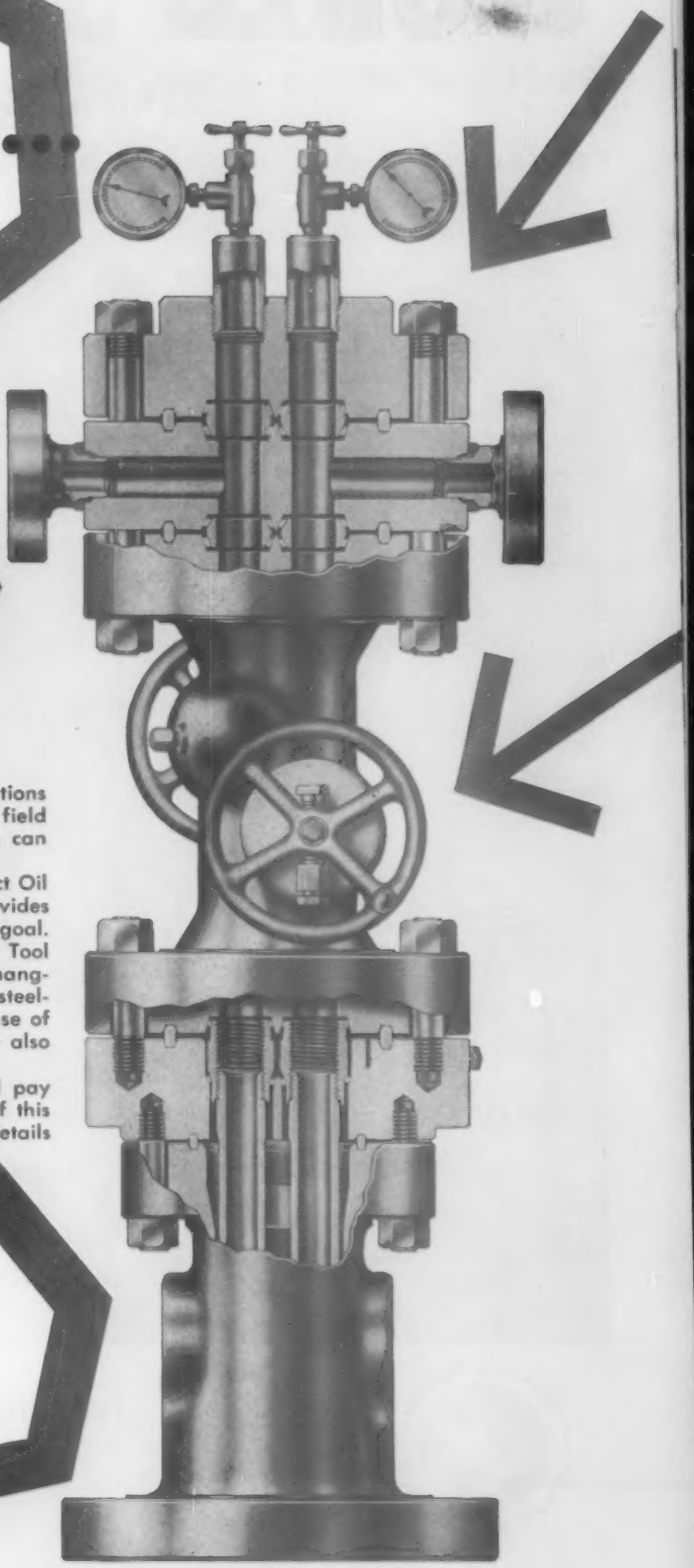
PRESSURE BULK STORAGE

ANHYDROUS AMMONIA EQUIPMENT

LP-GAS SYSTEMS

SHREVEPORT, LOUISIANA — Sales Offices: *Dallas, Houston, Corpus Christi, and Midland, Texas • New Orleans, Louisiana • Tulsa, Oklahoma • Denver, Colorado • Los Angeles, California, and Cie. Ingersoll-Rand, Paris, France*

If you make a DUAL COMPLETION...



MAKE IT O·C·T

FROM AN ECONOMIC STANDPOINT, dual completions provide the industry with substantial savings in any field where conditions are such that dual completions can be accomplished.

FROM AN EQUIPMENT STANDPOINT, this compact Oil Center Tool Company Christmas Tree assembly provides a safe, strong and practical means to the economic goal.

In developing this dual assembly, Oil Center Tool Company presents these new features: 1. a special hanging and sealing flange on top of the tubing head; 2. steel-to-steel seals throughout the assembly through the use of Flex-Float steel rings. Standard API ring joints are also used as a seal from the atmosphere.

If you are considering dual completions, it will pay you to check these features and get the full story of this new O-C-T Dual Completion Assembly. Write for details or ask your nearest O-C-T Representative.

O·C·T

OIL CENTER TOOL CO.

P. O. Box 3091, Houston, Texas

Export Representatives: Sterling Areas—Le Grand, Sutcliff & Gell, Ltd., Rochester, Kent, England. South America—East West Oiltools, C. A., Del Lago Hotel, Maracaibo, Venezuela. Address Export Inquiries for All Other Countries to P. O. Box 3091, Houston, Texas.

WORLD'S LARGEST

KERMAC RIG 46

Taller than a 10-story building, two-thirds the size of a city block, Kermac Rig 46 is designed to carry the search for precious oil farther off-shore than ever before.

This radically new concept in offshore rig design, built by Ingalls for the Kerr-McGee Oil Industries, Inc., is basically a series of pressure tubes built to ride out the toughest hurricanes. Capable of drilling 6 wells without relocating in water up to 70 feet deep, Kermac Rig 46 provides 3600 square feet of air conditioned quarters for a crew of 50, a helicopter landing, Texas deck and a derrick mast that towers 156 feet high even when standing in 70 feet of water.

Kermac 46 is the fourth in a series of offshore rigs Ingalls has built for Kerr-McGee. For experience, skill and economy in this expanding field consult a specialist in offshore drilling . . . call on Ingalls.

INGALLS SHIPS . . . SERVE THE WORLD . . .

DESIGNERS AND BUILDERS
of Offshore Service Vessels, Drilling and Commercial Barges, Tankers, Naval and Merchant Vessels.

THE INGALLS SHIPBUILDING CORPORATION
Executive Offices: Birmingham, Alabama
Shipyards: Pascagoula, Mississippi; Decatur, Alabama
Sales Offices: New York, Washington, Philadelphia, Houston, New Orleans, Chicago, Atlanta

W-K-M® PRODUCTS

are used wherever oil and gas are produced, transported or processed

W-K-M Production Valves

W-K-M Pipeline Valves

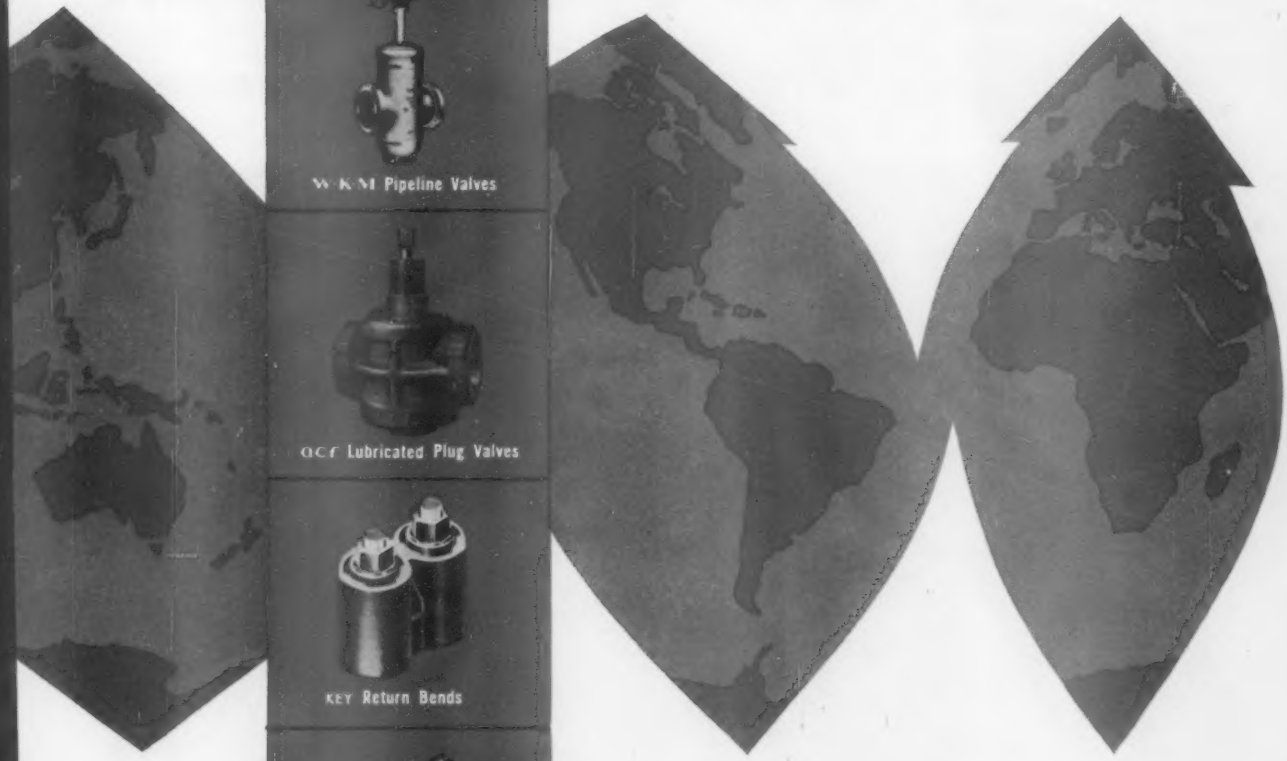
acf Lubricated Plug Valves

KEY Return Bends

KEY-KAST Fittings

W-K-M/AVION
Automatic Well Tester

W-K-M/AVION
Automatic Custody
Transfer Control System



W-K-M products have distinguished themselves for long, efficient life, and lower maintenance on wells, pipelines, in refineries and in petrochemical plants all over the globe.

This reputation for long-lasting, trouble-free performance, results from advanced research and engineering, combined with constant quality control in one of the world's most modern plants.

Ask your **W-K-M** Representative for full details of the many advantages provided by **W-K-M** products in your operations.

5624

W-K-M

DIVISION OF acf INDUSTRIES INCORPORATED

PLANT: MISSOURI CITY, TEXAS

MAILING ADDRESS: P. O. BOX 2117, HOUSTON, TEXAS

A Carload of

D+B PRECISION

LASTS LONGER—

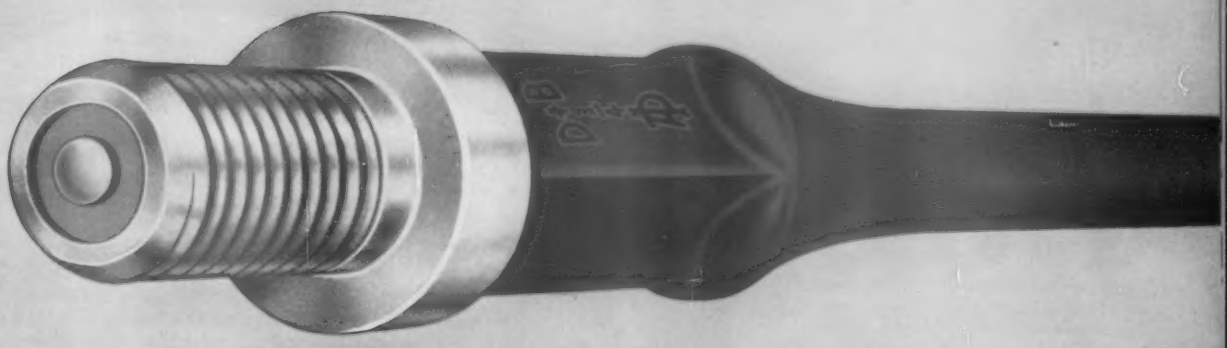
Most operators buy D+B Sucker Rods by the carload—some buy many cars—because they have more hours of actual pumping life, save the operator time and money, and cut down-time to a minimum.

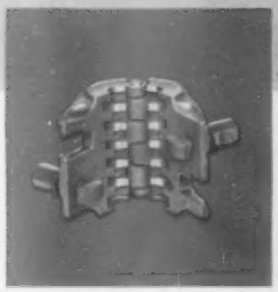
Precision manufacturing, the best scientifically controlled materials, careful inspection and shipping, and 50 years of experience, stand back of every D+B Sucker Rod. Is it any wonder they stay in the hole longer?

Transfer Control System

-BUILT SUCKER RODS

RESISTS CORROSION — CUTS DOWN-TIME!





D+B KWIK-GRIP® ROD CLAMPS
—FOR ONE-MAN INSTALLATION

Eliminates "knuckle busting." Easy quick opening is provided by a quarter turn of Tee-head permitting special forged bolt to slide through slot to remove clamp. Meets API specifications for pulling load.

D+B DUAL-PAC® STUFFING BOX
—A MAJOR TIME SAVER

Use of dual packing permits replacing the pressure seal packing easily without killing the well. Due to superior design, the higher the well pressure, the tighter the seal. Exceptionally wear resistant.

Get all the facts today about D+B Sucker Rods—the life line of the oil pumping business. Call or see your nearby Continental-Emsco store.

CONTINENTAL-EMSCO

Serving the Oil and Gas Industries ... Worldwide

CONTINENTAL-EMSCO COMPANY

A Division of The Youngstown Sheet and Tube Company

General Offices: DALLAS, TEXAS • Plants: LOS ANGELES • HOUSTON • GARLAND, TEXAS

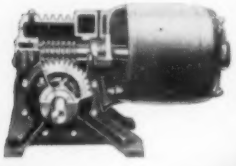
Representatives in All Principal Oil Fields of the World

SR-701

How to dial a pair of pants

MASTER

At the touch of a switch, unit rotates and indexes correct order to delivery position. It's fast, accurate and multiplies floor space efficiency. Power is a ⅓ H.P., 115/230 volt, 60 cycle, 1 phase Master Right Angle Gearmotor.



ANOTHER DRIVE REQUIREMENT MEETS ITS MASTER

You look at a motor application in an ad, and 99 times out of a hundred first thing you say is, "But my problem's different." Here, it's 100 to one you'll be right.

Point is the manufacturers of this fast, efficient and extremely ingenious dry cleaning storing mechanism told Master what they needed. Light, geared-down, steady power, full start, positive stop. And whenever the attendant in a progressive shop so equipped dials your pants, a Master Gearmotor delivers the goods.

And Master can deliver the goods for *you!* Master components can be integrated in any combination to give you the right horsepower, right shaft speed, right mounting features, in a single, efficient compact unit. See Master for your drives!

Motor Ratings	⅛ to 400 H.P. All phases, voltages, frequencies.
Motor Types	Squirrel cage, slip ring, synchronous, repulsion-start induction, capacitor, direct current.
Construction	Open, enclosed, splash-proof, fan-cooled, explosion-proof, special purpose.
Speeds	Single-speed, multi-speed, and variable speed.
Installation	Horizontal and vertical, with or without flanges and other features.
Power Drive Features	Electric brakes (2 types)—5 types of gear reduction up to 432 to 1 ratio. Mechanical and electronic variable speed units—fluid drives—every type of mounting.

MASTER ELECTRIC MOTORS

THE MASTER ELECTRIC COMPANY • Dayton 1, Ohio

They Say—

Aqaba—Another Oil Waterway

Dear Sir:

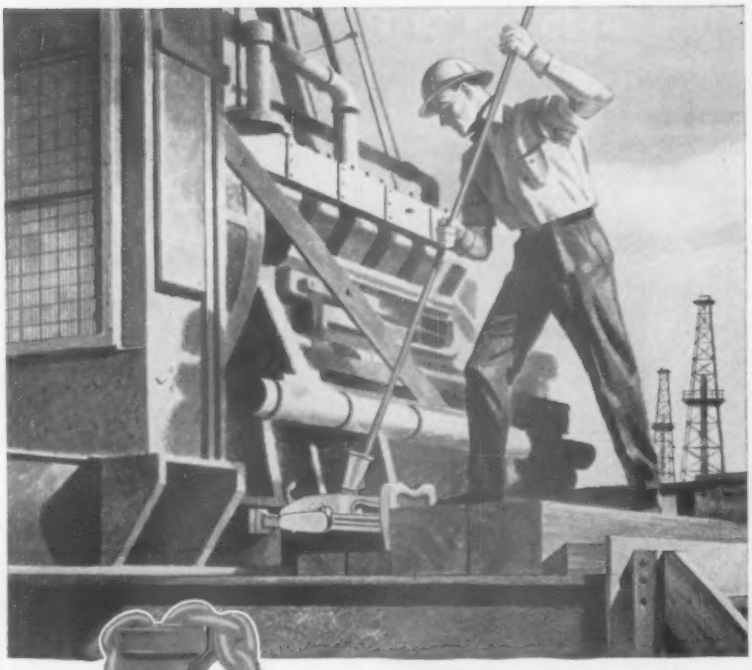
The question of free navigation in international waterways is of vital concern. . . While the Suez Canal has been in the headlines almost continuously for the past few months, little note has been taken of the fact that there is another link between the Mediterranean and the Red Sea . . . The Gulf of Aqaba. . .

Near the southern end, where the gulf merges in the Red Sea, two small uninhabited islands are situated—Tiran and Sanafir—which Egypt occupied in 1950. When Egypt first occupied the islands, the Egyptian foreign minister affirmed . . . that the occupation was not intended to place obstacles in the way of innocent passage through the straits. . .

Despite this assurance, the Government of Egypt has blocked the passage of Israel-bound ships through the Straits of Tiran and maintained an illegal blockade of the port of Eilat. . . It was only the occupation by Israel which opened up the straits and the gulf to international shipping. Freedom of navigation to the Gulf of Aqaba is a matter of vital importance to Israel. . . The port of Eilat is being rapidly enlarged and fitted for the handling of ships of large tonnage. . . An oil pipeline between Eilat and the Mediterranean Coast is under construction, while a second pipeline of much larger dimensions is being planned.

Eilat could become a pivotal point for international trade between the Mediterranean and the Indian Ocean if the present freedom of navigation is maintained. . . The passage through Aqaba could offer an alternative route to the Suez Canal. Recent events have shown that the Suez Canal can easily be obstructed by accident or design and can at all times be closed at the whim of Egypt's rulers. The development of the Aqaba route would break the Egyptian monopoly. In any case the Suez Canal will soon not be adequate for the requirements of the oil transport from the Middle East to Europe which at present constitutes its primary function.

The proposed trans-Israel pipeline from Eilat to the Mediterranean Coast would obviate the need for some thirty 45,000-ton or twenty 60,000-ton tankers. This would represent an economy in capital investment of $270-$380 million. Furthermore, the use of the pipeline would result in annual savings exceeding $50 million a year for trans-



You can get the "Roustabout 1523" at your favorite supply store!

Why the "Roustabout 1523" is the best all-purpose jack for drillers

First, the "Roustabout" (Jack No. 1523) has plenty of power—15-ton capacity for loads applied to either head or foot lift. Second, this well-balanced jack can work at any angle at full capacity (note swivel base). Third, its slotted head takes special claw or chain for lifting, lowering, pushing or pulling pipe, beams, poles, etc. Fourth, the "Roustabout" oil field jack is equipped with a patented adjustable spring mechanism which assures positive engagement of rack teeth. The spring's tension can be easily adjusted with a screw driver without removing any part of the jack. Send for Oil Field Jack Bulletin Ad-19B.

DUFF-NORTON

Duff-Norton Jacks

DUFF-NORTON COMPANY

P. O. Box 1889 • Pittsburgh 30, Pennsylvania

COFFING HOIST DIVISION: Danville, Illinois

Rachet Jacks, Screw Jacks, Hydraulic Jacks, Special Worm Gear Jacks, Rachet Hoists, Electric Hoists, Load Binders, Spur Gear Hoists

THESE ARE THE FEATURES THAT MAKE

ORBIT VALVES

SUPERIOR

STEEL DROP FORGINGS
Give body and bonnet maximum strength, no flaws, cracks or porous metal structures.

WELDED BONNET
Stronger construction, no bonnet gasket for exposure to corrosion.

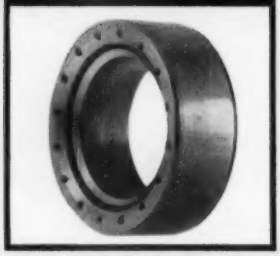
FRICTION-FREE SEALING
For easy operation—frequency of opening and closing immaterial.

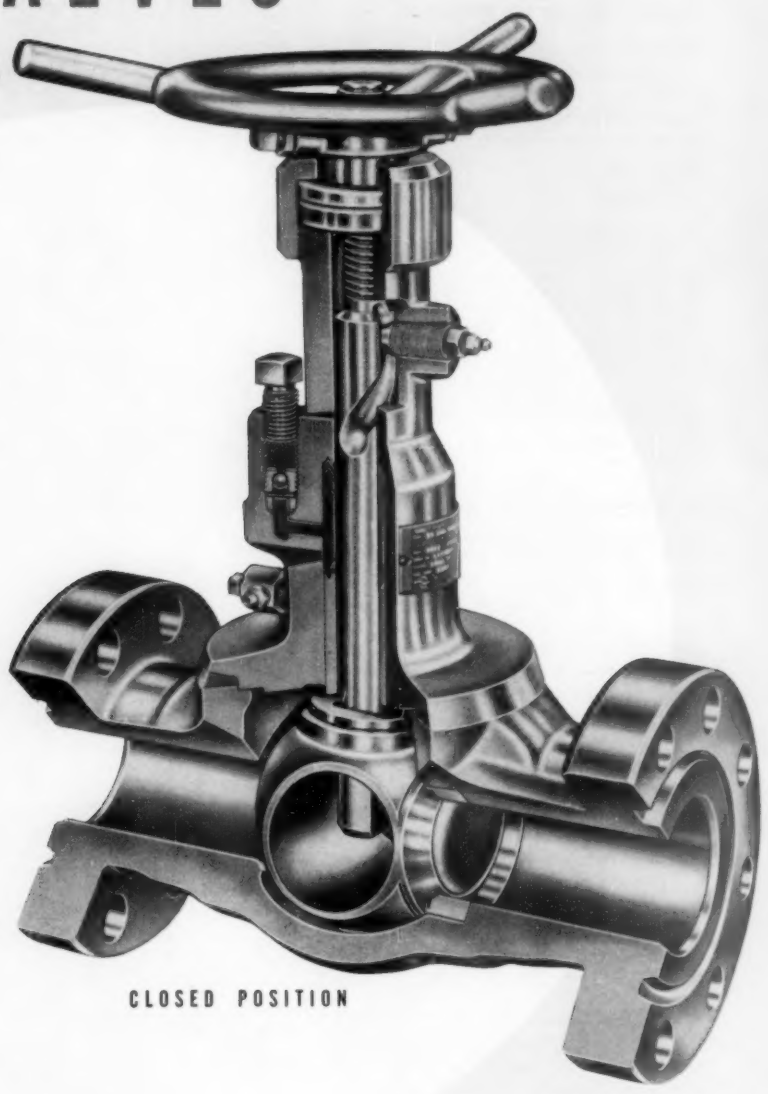
PACKING
Plastic stem packing, teflon base, pliable, adjustable. Can add to or adjust while valve is in service and under pressure.

SEATING
Segment of seating core face is hard faced and ground, for spherical seating to resilient body seat.

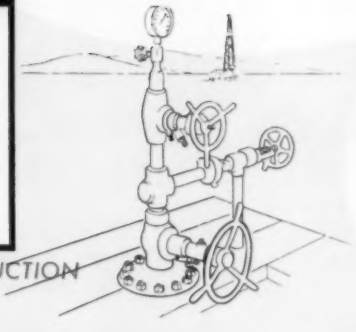
FULL ROUND OPENING
Available in six sizes, wide working pressure range, carbon or stainless trim, flanged or screw end. Venturi type tubing wing valve for christmas tree service, 2" x 1" only, Flanged end, 4,000, 6,000 and 10,000 lbs. test.

RESILIENT BODY SEAT: A type 416 heat treated stainless steel with Buna N synthetic rubber securely bonded into the annular groove of the seat ring. Tough and corrosion resistant.





CLOSED POSITION



FOR OIL AND GAS PRODUCTION

ORBIT VALVES ®

ORBIT VALVE COMPANY Box 699, LUther 5-1277, TWX TU 925 TULSA, OKLAHOMA **WAREHOUSES: Houston, Texas,** 407 Velasco, CApitol 8-6623, TWX HO 115; **Odessa, Texas,** 402 West County Road, FEderal 7-2263, TWX ODESSA TEX 8041; **Casper, Wyoming,** 247 West First St., Phone 3-5707, TWX CP 394; **Long Beach, California,** 1425 West 15th Street, HEmlock 7-6206; **Edmonton, Alberta, Canada,** 7119-104th Street, Phone 391-283 **CANADIAN REPRESENTATIVE:** T. R. Pickford & Company, Ltd., Calgary, Alberta, 536 8th Avenue West, Phone 2-7371 **EXPORT REPRESENTATIVE:** New York 36, N. Y., 500 Fifth Ave., BRyant 9-2236

portation and thus in the landed cost of fuel in Western Europe.

K. Bergman,
General Secretary
J. D. Mann,
Acting President
Jerusalem Chamber of Commerce.

Another Oklahoma Mockery

Dear Sir:

It takes intestinal fortitude to speak as plainly as you do in the editorial on Oklahoma conservation *(The Oil and Gas Journal, December 31, 1956, page 86)*. As you say, it is not a new charge you make, but it is well supported.

May I recite another mockery: The producer has to make a monthly report on an oil and gas lease, one for gas sales and one for oil, and each has to be notarized. The producer cannot make the report until he obtains the accounting which often comes with the check from the purchaser. It shows the gross, royalty, and the tax paid.

Why should the producer have to make the report when it is already made by the purchaser? When the lease makes 6 bbl. of oil and 50 M.c.f. of gas, the requirement becomes ludicrous. It looks like reports for reports' sake.

Emby Kaye
Tulsa.

Shot Holes and Fracturing

Dear Sir:

Your article in the January 14, 1957, issue on hydraulic fracing or fracking, whichever you prefer, is very interesting and I think covers the field quite thoroughly except for one angle on which I would like additional information.

As you know the Bartlesville sand in the area around Bartlesville, Okla., has been depleted of its gas, and for the most part the oil is brought to the bore hole by gravity in the stripper wells, except where water or gas has been introduced to the sand. Most of these old wells were shot with nitro when completed, creating a "shot hole." Some good results have been reported from fracturing these wells. Some operators have shot the sand with nitro and then set pipe above the sand and fractured.

We redrilled two old wells in the Cleveland sand at about 1,350 ft. with good results. One was an old core hole which we shot and then fractured; the other was originally shot and produced and then plugged. We cleaned it out and then fractured. In both cases we did not get a sharp breakdown, but apparently extended the fractures made by the shot.

This method of completion is a little more costly, but may give better results in that it gives a shot hole to

an ACCO product

Helicoid Gages

No Gears! No Teeth!

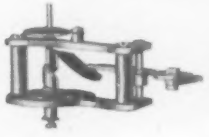
The gage of enduring accuracy

HELICOID Gages—without gears or teeth—last longer in rugged gage service because they eliminate the major sources of gage trouble. There can be no wearing and fouling of teeth or excessive play between teeth because there are no gears, no teeth in HELICOID Gages.

No expense has been spared in extensive research, engineering and testing equipment to produce this outstanding pressure instrument—a gage of the utmost precision and enduring accuracy.

HELICOID Gages are available for practically every type of installation and service—in many sizes and many styles—for pressure, vacuum or compound service. Furnished in a full range of pressures; all with the HELICOID stainless steel movement.

Write today for the HELICOID Gage Catalog

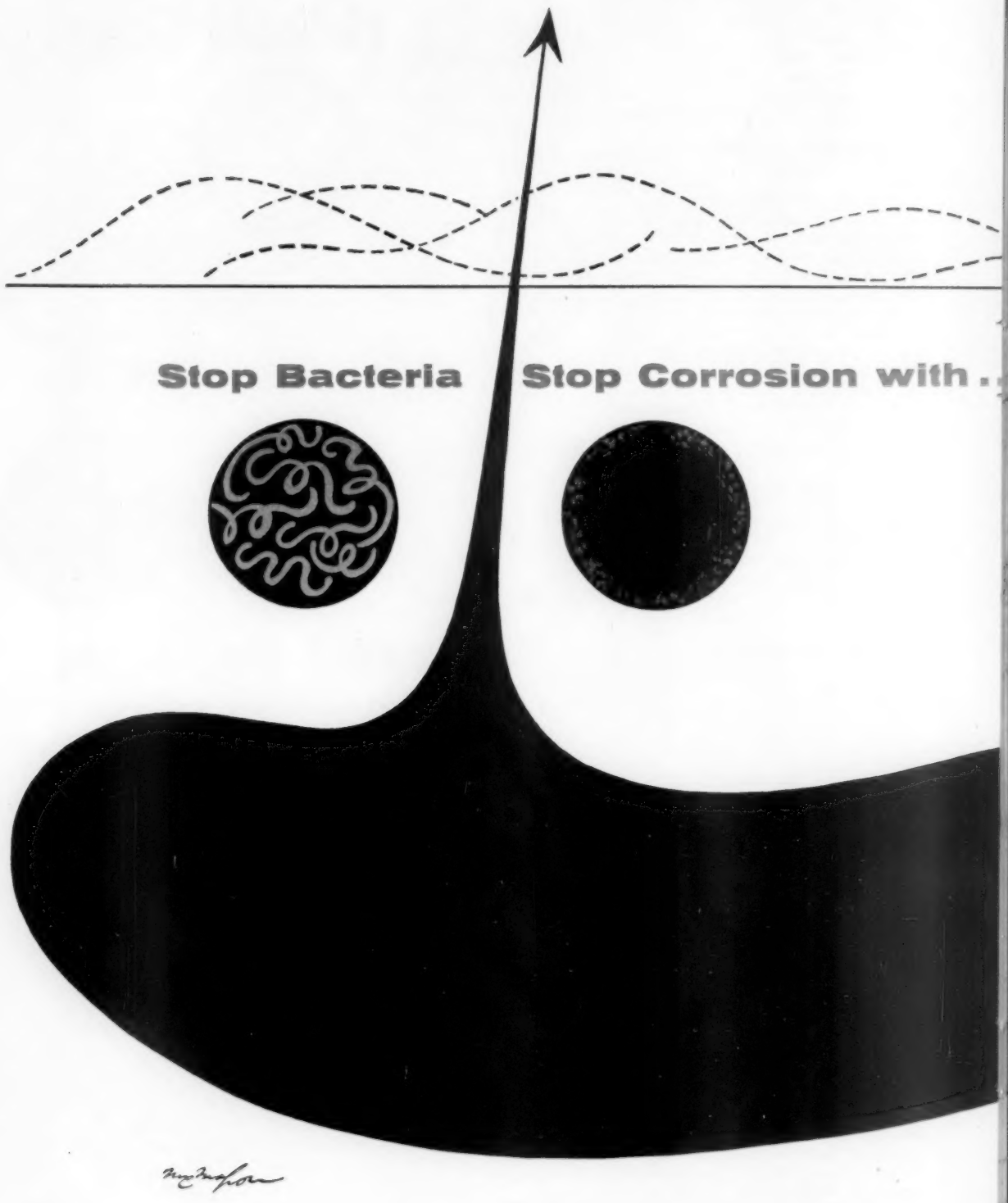


1 Stainless Steel HELICOID Roller (no gear teeth).
2 Stainless Steel Hair Spring.
3 Long Life Cam (no gear teeth).
4 Corrosion-resistant Link and Screws.

ACCO
TRADE MARK

Helicoid Gage Division
AMERICAN CHAIN & CABLE
929-A Connecticut Avenue • Bridgeport 2, Connecticut

for Better Value


Stop Bacteria
Stop Corrosion with ..

Reports from engineers in the field show: Armour polar organic chemicals give 99.5% corrosion protection, and *complete* bacteria control—in concentrations as low as 6 ppm!

This remarkable record of success is a direct result of polar organic ability to be absorbed continuously on metallic surfaces, forming a durable barrier against corrosive attack.

Equally important, they also adsorb on the surface of micro-organisms, disrupting the metabolic processes—particularly on the sulfate reducers, pseudonomas, iron, and sulfur-forming types.

By using these Armour chemicals, your injection rates and pressures stay constant. Your equipment lasts longer.

Armour makes a series of polar organic inhibitors designed to solve specific problems. Look below for one to help you.

Armac® CD-50 (Distilled coco amine acetate salt, 50% active). A corrosion inhibitor-bactericide for water systems, this chemical has been proved effective in high brines or fresh water systems.

Duomeen® CD-50 (Distilled coco aliphatic diamine, 50% active). An extremely effective bactericide, but also an excellent corrosion inhibitor.

Duomeen CDA-50 (Distilled coco aliphatic diamine adipate salt, 50% active). An excellent bactericide and corrosion inhibitor that has found application in systems where carbon dioxide and oxygen corrosion are a problem.

Arquad® T-2C (Mixed monoalkyl and dialkyl quaternary ammonium chloride). A corrosion inhibitor and bactericide especially effective in low brines and fresh water systems.

Duomeen T (Tallow aliphatic diamine). An effective intermediate chemical for those who desire to formulate their own corrosion inhibitors or bactericides.

Duomeen TDO-50 (Liquid) (Tallow aliphatic diamine dioleate, 50% active). An easy to use, oil soluble, water dispersible down-the-hole corrosion inhibitor also being utilized to inhibit corrosion in salt water disposal systems and in producing wells.

Duomeen TDO (Fluid paste) (Tallow aliphatic diamine di-oleate). 100% active, oil soluble corrosion inhibitor.

.... ARMOUR CHEMICALS FOR OIL PRODUCTION

Armour Chemicals Solve Refining Problems

Armour's line of polar cationic surface-active agents are being widely used in refineries to solve both operational and product problems.

The Armeens® and Duomeens® are typical of the Armour cationics that have resulted from laboratory and field evaluations. These materials and their derivatives are used in:

- *Controlling corrosion in processing equipment and finished product storage.*
- *Improving wear properties and acting as acid scavengers in lube oils.*
- *Inhibiting or solubilizing sludge formation in refinery products. . . . Stabilizing color . . . Improving filterability . . . Preventing fouling in equipment.*

For application information, product data, samples and treatment procedures, mail the coupon below.

NEW INFORMATION! HOW TO INCREASE PRIMARY AND SECONDARY OIL PRODUCTION! G2

- ☐ Send me booklet "Armour Organics For Increased Oil Production."
- ☐ Samples of _____ (fill in chemical desired)
- ☐ Application information on _____
- ☐ Treatment procedures for _____

Name _____ Title _____

Firm _____

Address _____

City _____ Zone _____ State _____

Armour Chemical Division • 1355 West 31st Street • Chicago 9, Ill.

ARMOUR

Leader in Progressive Fatty Acid Chemistry

ARMOUR CHEMICAL DIVISION
©Armour and Company • Chicago 9, Illinois

E. R. P. engineer inspects control panel for cathodic system protecting clarifiers at Louisville Water Co., Louisville, Ky.

E. R. P. CATHODIC PROTECTION

stops corrosion at lowest overall cost

Electro Rust-Proofing Cathodic Protection is used by the Louisville Water Company to prevent corrosion of metal underwater equipment in the raw water clarifiers.

Cathodic protection is the one method able to reduce corrosion of underwater metal virtually to zero. Electro Rust-Proofing Cathodic Systems are designed to provide the sole protection of submerged structures or to supplement a good protective coating. When used in conjunction with coatings, cathodic protection eliminates corrosion due to holidays or inherent breaks in coatings such as can occur at many inaccessible structural joints.

Electro Rust-Proofing designs every cathodic system individually so that maximum protection is given for the lowest operating cost. For information about E.R.P. Cathodic Protection, write for Bulletin #E-39.

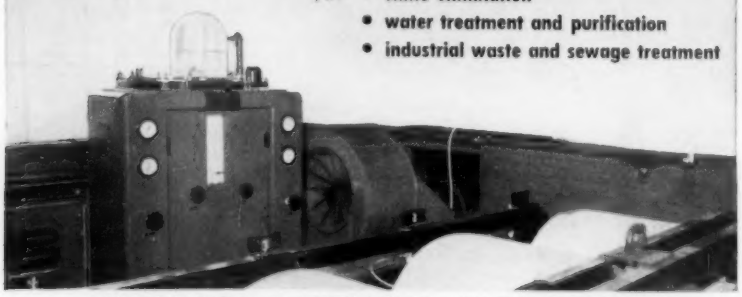
ELECTRO RUST-PROOFING CORP.

A SUBSIDIARY OF WALLACE & TIERNAN INC

30 MAIN STREET, BELLEVILLE 9, NEW JERSEY

CHLORINATORS and CHEMICAL FEEDERS

for
- slime elimination
- water treatment and purification
- industrial waste and sewage treatment



WALLACE & TIERNAN INCORPORATED

25 MAIN STREET, BELLEVILLE 9, NEW JERSEY

CD-41

accumulate the oil. This is beneficial in partially depleted sands where reservoir energy is gone. I will appreciate any information you may have on this method of completion, and also the results others have had who have tried it.

Owen I. Jones
Bartlesville, Okla.

CALENDAR

FEBRUARY

15-15 National Association of Corrosion Engineers, Tulsa section, eighth annual short course for pipeliners, Hotel Mayo, Tulsa.

14-15 American Institute of Mining, Metallurgical, and Petroleum Engineers, joint annual technical meeting, University of Texas and Texas A. & M. College, Hogg Auditorium, Austin, Tex.

15-16 National Society of Professional Engineers, spring meeting, Hotel Francis Marion, Charleston, S. C.

17-18 Engineers Joint Council, Statler Hotel, New York.

21-22 Chemical Institute of Canada, eleventh division conference, protective coatings division, Seaway Hotel, Toronto, February 21, and Ritz Carlton Hotel, Montreal, February 22.

22 Natural Gasoline Association of America, Permian basin regional meeting, Scharbauer Hotel, Midland, Tex.

24-28 American Institute of Mining, Metallurgical and Petroleum Engineers, annual meeting, Hotels Roosevelt and Jung, New Orleans.

25-27 American Association of Petroleum Geologists, Rocky Mountain section, Rainbow Randevu, Salt Lake City.

27-28 Gas Conditioning Institute, sponsored by the University of Kansas extension, Southwest Kansas Center, Randall's, Liberal, Kans.

MARCH

1 American Institute of Chemical Engineers, Sabine area section, and American Chemical Society, Texas-Louisiana Gulf section, fourth annual joint technical meeting, Lamar College of Technology, Beaumont, Tex.

3-6 American Institute of Chemical Engineers, regional meeting, the Greenbrier, White Sulphur Springs, W. Va.

6-8 American Petroleum Institute, southwestern district production division meeting, Statler-Hilton Hotel, Dallas.

8 Ohio Oil and Gas Association, winter meeting, Deshler-Hilton Hotel, Columbus, Ohio.

11-15 1957 Nuclear Congress, sponsored by National Industrial Conference Board and Engineers Joint Council, Convention Hall, Philadelphia.

11-15 American Institute of Chemical Engineers, regional meeting, Philadelphia.

11-15 National Association of Corrosion Engineers, Kiel Auditorium, St. Louis.

11-21 Quality Control by Statistical Methods, tenth annual short course, sponsored by University of Illinois, College of Engineering and Division of Engineering Extension, Champaign, Ill.

12-13 Subsurface Geology Symposium, fifth annual conference, sponsored by the University of Oklahoma, Norman, Okla.

13-15 Society of Exploration Geophysicists, tenth annual mid-western meeting, Hotel Texas, Fort Worth.

YOUR J&L PUMP SHOP

—a production prodigy!

Men in J&L pump shops are as eager as bird hunters. Every order for a bottom hole pump triggers their interest — is a welcome challenge to Axelson efficiency and J&L ingenuity.

The interesting objective — always — is to make that well of yours yield its maximum at minimum cost.

And these men in J&L pump shops can do it. They are doing it all over the United States and Canada.

Moreover, they can keep a pump going economically—forever. *Never Junk an Axelson.*

Experience, enthusiasm, know-how! Just call your J&L Supply number.

An Axelson pump as visualized by trained men in J&L field shops. This one happens to be a Sure-Seal solution to a knotty problem.

Jones & Laughlin

SUPPLY DIVISION - Tulsa

SERVING THE UNITED STATES AND CANADA

25-G

WELL PROTECTION

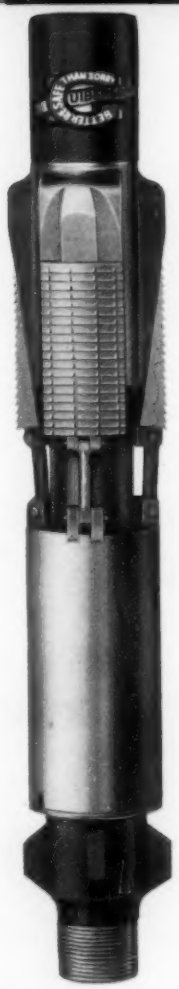
..and WELL WORTH IT!

GUIBERSON TUBING CATCHERS

Guiberson tubing catcher with anchor stops tubing motion — gives you full protection running in and out the hole. This combination saves wear on tubing, collars and threads — helps prevent leaks. It makes the pumping operation produce more fluid with less power.

Guiberson tubing catcher gives you low-cost insurance against accidents, lost time and production. It lets you forget the danger of cork-screwed or telescoped tubing. Should the string part or fall, the Guiberson tubing catcher automatically stops tubing with a drop of less than three inches.

Guiberson tubing catchers are made in all casing sizes and weights.



TYPE E
TUBING CATCHER

TYPE E
WITH ANCHOR

THE
GUIBERSON
CORPORATION

ESTABLISHED 1919
DALLAS, TEXAS
U. S. A.

Sold by
Oil Field Supply Stores
Everywhere

REDA PUMPS

FIRST CHOICE

FOR SECONDARY RECOVERY WATER FLOODING . . .

because pumping with REDA lowers costs and INCREASES PROFITS!

HERE'S HOW:

- Large water volume obtained from smaller size well casings reducing number of supply wells necessary
- Flexibility of Reda Pumps in meeting changing water requirements common to most waterflooding projects
- Easier, less expensive installation and lower maintenance costs
- Low operating costs and long operating life of Reda equipment
- Corrosion resistance of Reda pumps is superior to any other pumping unit used in supply wells

Reda Submergible Pumps are a major factor in the success of waterflooding and pressure maintenance operations. They are being used in major floods with very successful results of increased production and lowered costs.

Write for complete information today! Reda engineers will be pleased to call and assist in planning operations.

SIGN OF QUALITY . . . SUBMERGIBLE REDA PUMPS

REDA

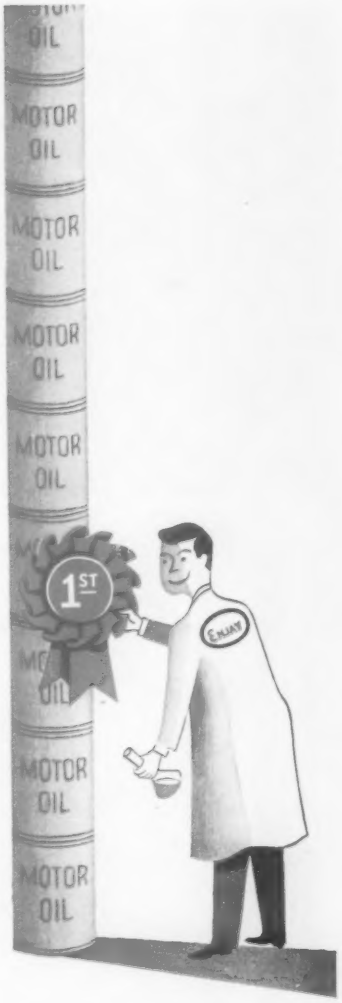
PUMP COMPANY

BARTLESVILLE, OKLA.

18-21	American Society of Mechanical Engineers, national conference, gas-turbine power division, Sheraton-Cadillac Hotel, Detroit.
20-22	American Petroleum Institute, southern district production division meeting, Washington-Youree and Captain Shreve Hotels, Shreveport, La.
25-27	Western Petroleum Refiners Association, annual meeting, Hilton Plaza Hotel, San Antonio, Tex.
25-29	American Society for Metals, Western Metal Exposition and Congress, Ambassador Hotel and Pan-Pacific Auditorium, Los Angeles.
27-29	American Power Conference, Sherman Hotel, Chicago.

APRIL

1-4	American Association of Petroleum Geologists, Society of Economic Paleontologists and Mineralogists, national convention, Kiel Auditorium, St. Louis.
2-4	Corrosion Control, fourth annual conference, sponsored by National Association of Corrosion Engineers and the University of Oklahoma College of Engineering, University of Oklahoma, Norman, Okla.
7-10	Petroleum Equipment Suppliers Association, annual convention, Palm Springs, Calif.
7-12	American Chemical Society, national meeting, Miami, Fla.
8-10	American Society of Mechanical Engineers, spring meeting, Dinkler-Tutwiler Hotel, Birmingham, Ala.
9-11	American Welding Society, fifth annual welding show, Convention Hall, Philadelphia.
10-12	American Petroleum Institute, Mid-Continent district production division meeting, Mayo Hotel, Tulsa.
11-12	West Texas Oil Lifting Short Course, Texas Technological College, Lubbock, Tex.
11-13	Institute of Radio Engineers, ninth annual southwestern I.R.E. conference and electronics show, sponsored by Houston section, Shamrock Hilton, Houston.
11-13	Institute of Radio Engineers, second national simulation conference, sponsored by Professional Group on Electronic Computers, Shamrock Hilton Hotel, Houston.
11-13	American Institute of Mining, Metallurgical, and Petroleum Engineers Pacific Northwest Regional Conference, Portland, Ore.
16-18	Petroleum Industry Electrical Association annual meeting, Shamrock Hilton Hotel, Houston.
16-18	Petroleum Electric Suppliers Association, Shamrock Hilton Hotel, Houston.
16-18	Southwestern Gas Measurement Short Course, University of Oklahoma, Norman, Okla.
16-18	National Petroleum Association, fifty-fourth semiannual meeting, Cleveland.
18-19	Texas Petroleum Research Committee and Permian Basin Section of American Institute of Mining, Metallurgical, and Petroleum Engineers, tenth annual oil-recovery conference, Midland, Tex.
22-25	Canadian Institute of Mining and Metallurgy, annual general meeting, Chateau Laurier, Ottawa.
24-26	National Gasoline Association of America, thirty-sixth annual convention, Rice Hotel, Houston.
24-26	American Petroleum Institute, Rocky Mountain district production division meeting, Gladstone, Townsend, and Henning Hotels, Casper, Wyo.
25-27	American Association of Petroleum



You can make the finest lubricants when you

BLEND WITH ENJAY PARAMINS®*

*the *only* complete line of high-quality additives for fuels and lubricants.

ENJAY

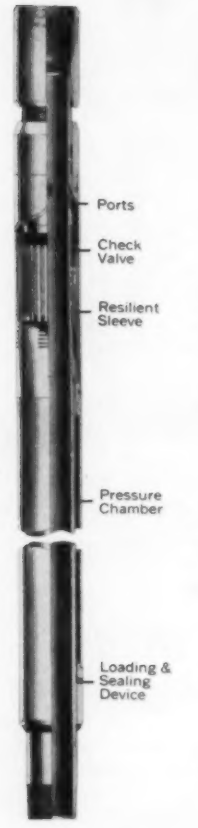
Pioneer in Petrochemicals

ENJAY COMPANY, INC., 15 W. 51st ST. NEW YORK 19, N. Y.

Akron, Boston, Chicago, Los Angeles, New Orleans, Tulsa

TYPE C

"SLIM JIM" — 3 1/16" O. D. x 2" I. D.



the only concentric, full-opening, collar-size valve on the market

- O.D. is equal to $3\frac{1}{16}$" — the same as standard 2" E.U.E. coupling
- I.D. is larger than 1.901" drift diameter of 2" E.U.E. tubing
- The Type C can be used in dually-completed wells on the weak zone, affording unrestricted passage through tubing for any normal well operation . . . with the same concentric O.D. as the tubing collars
- In parallel-string installations, valve can be rotated with both strings in place
- The Type C can be operated as either a continuous or intermittent valve, simply by surface changes
- Special, normally-closed check valve within the flow valve affords positive protection against back flow into casing
- Three ¼" ports — a flow area almost *double* that of other valves

OTIS — PRESSURE CONTROL — SERVICE — EQUIPMENT

OTIS PRESSURE CONTROL, INC.

General Offices and Plant: 6612 Denton Drive, Dallas
Gas Lift Division: 2402 Broad St., Houston
Branches Throughout the Oil Country

Landmen, third annual convention, Hilton Hotel, San Antonio, Tex.

28-30 Independent Petroleum Association of America, midyear meeting, Buena Vista Hotel, Biloxi, Miss.

29-30 Automatic Control in the Petroleum and Chemical Industries, conference sponsored by the University of Oklahoma, extension study center, University of Oklahoma, Norman, Okla.

29-May 1 Southern Gas Association, annual convention, New Orleans.

MAY

1-3 American Petroleum Institute, Division of Production, eastern district meeting, William Penn Hotel, Pittsburgh.

6-8 American Petroleum Institute, annual pipeline conference, Cleveland Hotel, Cleveland.

6-8 American Geophysical Union, thirty-eighth annual meeting, National Academy of Sciences, Washington, D. C.

7 American Gas Association, committee on underground storage, operating section, Mark Hopkins Hotel, San Francisco.

8-10 American Gas Association, Pacific Coast Gas Association, gas supply, transmission, and storage conference, Mark Hopkins Hotel, San Francisco.

12-15 Liquefied Petroleum Gas Association, annual meeting, Conrad Hilton Hotel, Chicago.

13-15 Industrial Waste Conference, sponsored by Purdue University, Purdue Memorial Union Building, Lafayette, Ind.

13-16 American Petroleum Institute, division of refining, midyear meeting, Sheraton Hotel, Philadelphia.

14-16 Industrial Nuclear Technology Conference, sponsored by Armour Research Foundation of Illinois Institute of Technology and Nucleonics Magazine, Museum of Science and Industry, Chicago.

16-17 American Petroleum Institute, division of production, Pacific Coast district meeting, Hotel Biltmore, Los Angeles.

19-22 Texas Independent Producers and Royalty Owners Association, Galvez and Buccaneer Hotel, Galveston, Tex.

20-22 American Petroleum Institute, division of transportation, central committee on transportation by water and tanker corrosion symposium, San Francisco.

20-22 American Gas Association, chemical, engineering, and manufactured gas production conference, Balmoral Hotel, Bal Harbour, Fla.

20-23 American Society of Mechanical Engineers, twenty-ninth annual conference and exhibit of the oil and gas power division, Kentucky Hotel, Louisville, Ky.

21-23 Pennsylvania Gas Association, annual meeting, Pocono Manor Inn, Pocono Manor, Pa.

23-24 Kentucky Oil and Gas Association, annual membership meeting, Hotel Phoenix, Lexington, Ky.

23-24 American Institute of Mining, Metallurgical, and Petroleum Engineers, third annual joint meeting, Rocky Mountain petroleum sections, Northern Hotel, Billings, Mont.

23-24 Western Petroleum Refiners Association, southwest regional technical-industrial relations meeting, Hotel Paso del Norte, El Paso, Tex.

29-31 Annual short course in gas technology, Texas College of Arts and Industries, Kingsville, Tex.

It takes a complete team to keep dependable drilling mud service available for you

Meet This Magcobar Man, the Flying Mud Engineer . . . whose plane is his office, workshop and laboratory

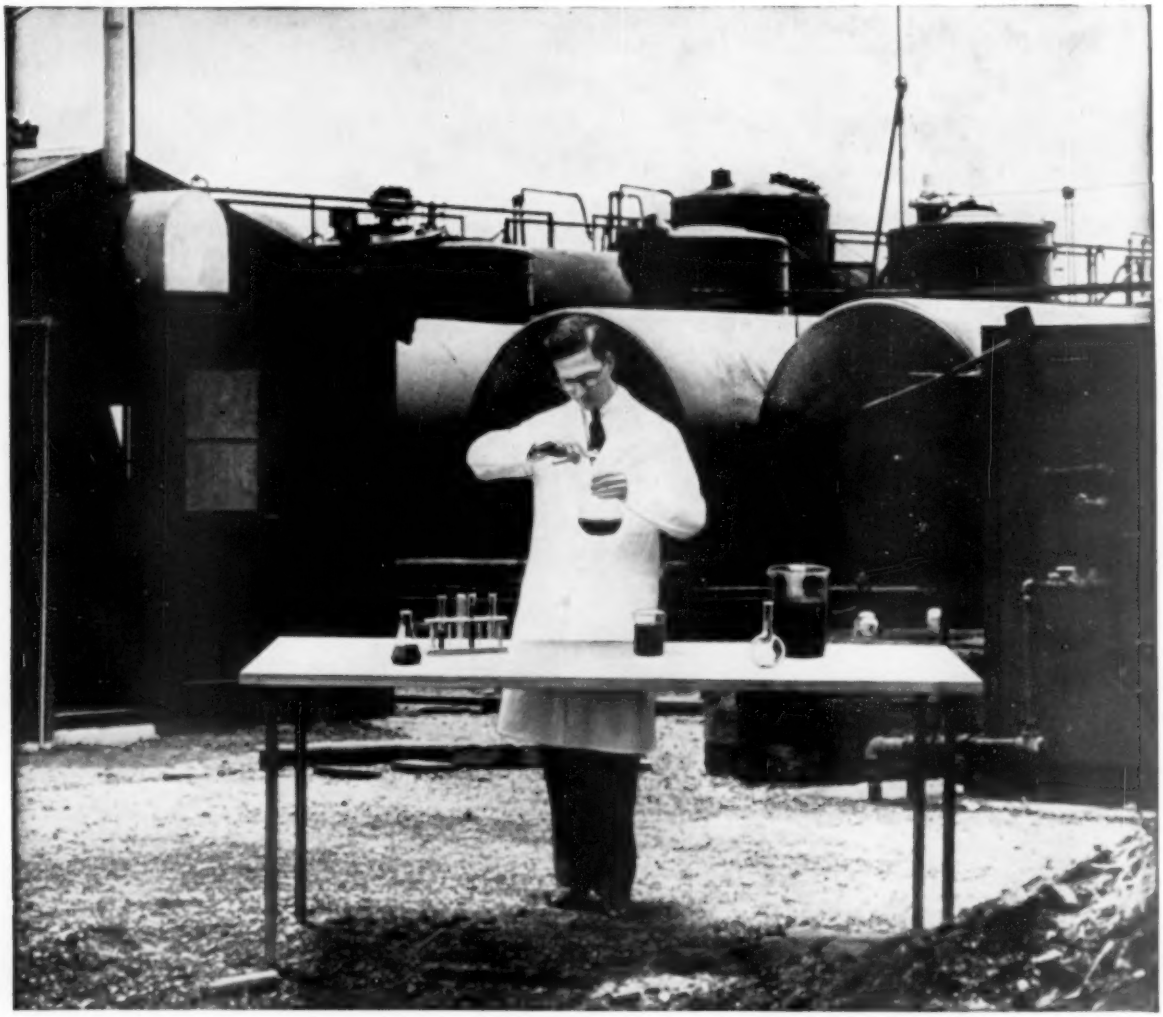
When you call a Magcobar Mud Engineer his first job is to get there fast — and he makes it his business to do just that. Along the Gulf Coast, there is a fleet of fast Magcobar float planes, piloted by Mud Engineers, to serve water locations. These laboratory-equipped planes serve as "home," office and workshop. Other Magcobar engineers use cars, trucks, boats, or walk, if that's the only way to get there. Wherever your drilling location is, in North America, there is a Magcobar Mud Engineer and a Magcobar dealer who combine to give you fast, efficient mud service at your rig.

When you need mud, or mud service, call Magcobar. You'll get the most complete service and finest quality drilling fluids in the oil fields.

Magcobar
Complete
DRILLING MUD SERVICE

MAGNET COVE BARIUM CORPORATION

Houston, Texas



What's a chemist got to do with tank cars?

Liquid level—vapor action—types of linings—temperature factors—the presence of impurities . . . these are a few of the considerations which the chemist must evaluate. It's the chemist's job to see that bulk liquids are shipped in the cars equipped to carry his products. The knowledge gained from years of hauling liquids in bulk enables General American to meet the chemist's exacting requirements—to assure that corrosion of the cars will be minimized and product contamination prevented.

This skill and experience is part of every GATX lease . . . a lease that provides shippers with the most dependable service available for bulk liquid transportation. When you lease cars from General American, you avoid the need for capital investment as well as operating, servicing and maintenance problems.

If you'd like additional information concerning the advantages of a GATX lease, call or write your nearby General American District Office.

It Pays to Plan With General American

GENERAL SERVICE CARS ALUMINUM CARS PRESSURE CARS INSULATED CARS

GATX GENERAL AMERICAN TRADE MARK

GENERAL AMERICAN TRANSPORTATION CORPORATION

135 South LaSalle Street • Chicago 90, Illinois
Service Offices In Principal Cities
Service Plants Throughout The Country

the OIL AND GAS JOURNAL

TULSA, OKLAHOMA

Published every Monday by The Petroleum Publishing Co., 211 South Cheyenne Avenue, Tulsa, Okla. Phone Diamond 3-6291. Founded in 1902. Name changed to The Oil and Gas Journal in 1910 by Patrick C. Boyle.

•

P. C. LAUINGER
President
S. H. ROURKE
Executive Vice President
MITCHELL TUCKER
Vice President and Advertising Manager
HANSON B. PIGMAN
Circulation Manager
DONALD W. WILSON
Manager Industry Census Department
J. PARKER HOLLAND
Production Manager

ADVERTISING OFFICES
TULSA
211 South Cheyenne, Diamond 3-6291
JOHN D. REILLY . . . Mid-Continent Manager
ROY E. FINLEY . . . . . Representative
D. B. MILLER . . . . . Classified Adv. Mgr.
NEW YORK
500 Fifth Avenue, LOngacre 4-6160
E. S. KLAPPENBACH . . . . . Eastern Manager
HARRY B. BULLEN . . . . . Representative
PHILADELPHIA
1509 Land Title Building
Broad and Chestnut Streets,
Rittenhouse 6-0118
JOHN W. MEANY, JR. . . . . District Manager
CHICAGO
105 West Madison Street, CEntral 6-2537
DAVID T. KENNEY . . . . . District Manager
KAREL WEGKAMP . . . . . District Manager
DETROIT
204 Washington Square Building,
Royal Oak, Mich., LIncoln 7-9455
JOHN D. YODER . . . . . District Manager
PITTSBURGH
106 Nelbon Avenue, FRemont 1-7775
ALFRED M. JONES . . . . . Manager
HOUSTON
802 Sterling Building, CApital 4-7726
JOHN M. SPEARS . . . . . Gulf Coast Manager
DALLAS
1238 Mercantile Bank Building,
Riverside 8-3074
PREN G. HOLLINGSWORTH Representative
LOS ANGELES
650 South Grand Avenue, VAndyke 0722
GEORGE O. RUPPERT . . . . . District Manager
ENGLAND
National Provincial Bank Chambers,
15 Grafton Street, Altrincham
Phone Altrincham 3160
HARRY BECKER . . . European Representative

•

Subscription rates to the petroleum industry, United States and foreign, 1 year, $4.00; 2 years, $7.00; 3 years, $8.00. Single copies: regular issues 50 cents; special issues $1.00. Back copies when over a year old, $1.00. Note: Payments from outside the U.S.A. may be made by international money order, New York Exchange, or check on a U.S.A. bank. Entered as second-class mail matter at Tulsa, Okla., under Act of March 3, 1879. Copyright 1957 by The Petroleum Publishing Co.

Member
Audit Bureau of Circulations
Associated Business Papers

JOURNALLY SPEAKING . . .

All at Sea

A COUPLE of articles on offshore oil in this issue (pages 91 to 101) describe some of the geological and financial puzzles of this interesting operation, but fail to mention a question that is intriguing experts in international law: Are these wells in the United States or are they in the high seas?

Uncle Sam and Louisiana have been lawing each other for some time over who gets the royalties and lease rentals in the Gulf of Mexico, but nobody can be certain that either one of them is entitled to a dime. Maybe everything produced beyond the 3-mile limit is "foreign" oil and ought to pay import duty.

It's all a matter of international law —which is a nebulous thing that isn't really law and isn't always international.

From along about 1600 until recent years, most countries have more or less accepted the idea that national sovereignty extends only 3 miles off the beach and that everything beyond is the high seas—international waters open to anybody to use as he pleases.

But it wasn't always that way. The Romans christened the Mediterranean "Mare Nostrum," meaning Our Sea. In the century after Columbus made his notable journey, various nations tried to expropriate the oceans and keep aliens out. The North Atlantic was staked out as the "English Sea," and a big area to the south was labeled the "Spanish Main."

Then the Dutch, who looked as though they would be left with nothing but their little old Zuider Zee, began screaming about "freedom of the seas." They invented the "international law" that a nation could control only as far out as it could shoot a cannon—which was then 3 miles. As we recall our history, it took the U. S.-British War of 1812 to really nail down that doctrine.

In recent years, however, several nations have been claiming much bigger strips of ocean, chiefly to protect fishing rights. El Salvador, for instance, claims it owns the Pacific Ocean for 200 miles out, though the country itself is only 70 miles wide.

The United Nations is now working on this problem of who owns how much of the ocean, but there is doubt that this project will get any further than other U. N. programs. Obviously the old cannon-shot rule is obsolete, because with intercontinental ballistic missiles a nation could claim all the oceans of the globe.

The United States Government is sort of walking the fence on this issue. An oil well has been drilled 50 miles out in the Gulf of Mexico. The Government says this well is still in the United States but not in any one of the states. It says the 3-mile limit holds so far as the surface of the ocean goes, but that a nation owns the ocean bottom out to the edge of the Continental Shelf—which in some places extends as far as 200 miles.

If this new doctrine becomes accepted, an offshore drilling platform and wellhead may turn out to be on the high seas, subject to no governmental jurisdiction except the rules of international law (whatever they are). But the well bore and the producing formation directly underneath would be in the United States.

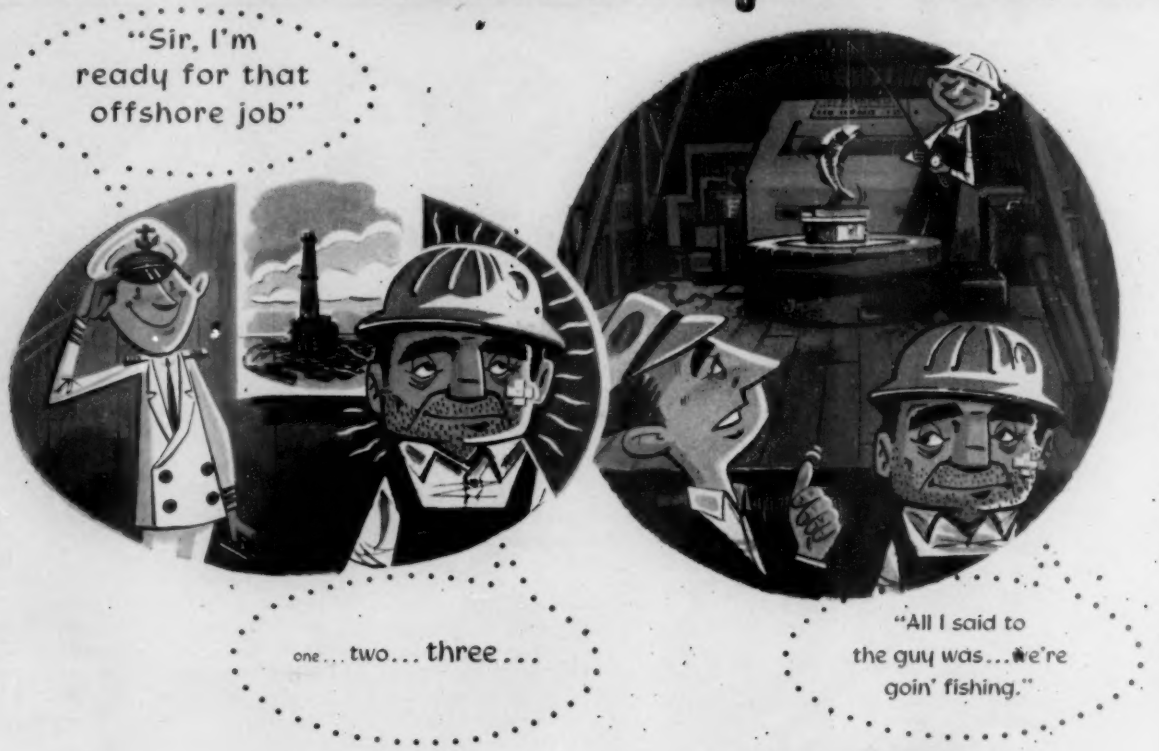
The Continental Shelf is, by mutual consent, considered to extend out to where the water is 600 ft. deep. If you want to drill for oil in water deeper than that you can, presumably, do so without saying aye, yes, or no to anybody. But maybe the United Nations would come around and try to claim the royalty.

It's all very confusing. But it's probably entirely an academic question. Certainly the oil companies don't seem to be worried about it. They don't care much who their landlord or royalty owner is so long as they are left alone to hunt for oil in their own ingenious ways.

According to the piece in this issue, the oil industry has invested a couple of billion dollars in somebody's Gulf of Mexico and is planning to spend as much more within a few years. Let's hope that international law becomes clarified so that operators on the high seas don't get classified with pirates, derelicts, or the man without a country.

—Henry D. Ralph.

Win $25...write a Joe Roughneck cartoon line



Joe Roughneck is a sort of composite spirit of the men who drill for and produce vital oil. You probably know dozens of Joe Roughnecks ... men on rigs in the field and men running progressive companies. Lone Star is dedicated to supplying them with API casing, tubing and line pipe.

Drawing on your own experience and things you've heard ... send us a Joe Roughneck cartoon line and suggestion for illustration. For every one that we use in our ads, we'll pay $25. Send in your oil field smile lines now. In case the same line is sent in by more than one person, the one with the earliest postmark will collect. All entries become the property of Lone Star Steel. Our employees, our advertising agency and their families may not compete.

Lone Star STEEL COMPANY

LSS

EXECUTIVE-SALES OFFICES
W. Mockingbird Lane at Roper • P. O. Box 12226 • Dallas, Texas

DISTRICT SALES OFFICES
Houston, Texas | Midland, Texas | San Antonio, Texas
Tulsa, Oklahoma | Wichita Falls, Texas | Shreveport, La.

Don't take this lying down

ONCE again the U. S. oil industry is the butt of the old political game of kicking the pants of the guy down the line.

To cover up their boner in Egypt, England and France are blaming the United States for their oil shortage. Our Government tosses the onus to Texas and the oil industry. And our press gleefully jumps in with both feet to fabricate calumnies against its favorite whipping boys—oil men in general and Texans in particular.

Now Congress is getting into the act with its usual custom of blasting the industry first and looking for facts later.

IF OIL MEN WERE only half as dumb, as short-sighted, and as selfish as their critics paint them there wouldn't be any oil industry. The facts, if anybody is interested in facts, are that the industry has done a great deal in a short time and on its own initiative toward meeting Europe's deficiency.

The six southwestern prorating states have raised their allowables by half a million barrels a day since October. The fact that actual production has increased less demonstrates that boosting output involves a lot more than just naming allowables. There are many valid, technical, legal, and practical reasons why allowables haven't gone up more. And there's no assurance that higher allowables would get additional oil to tidewater before the end of the emergency.

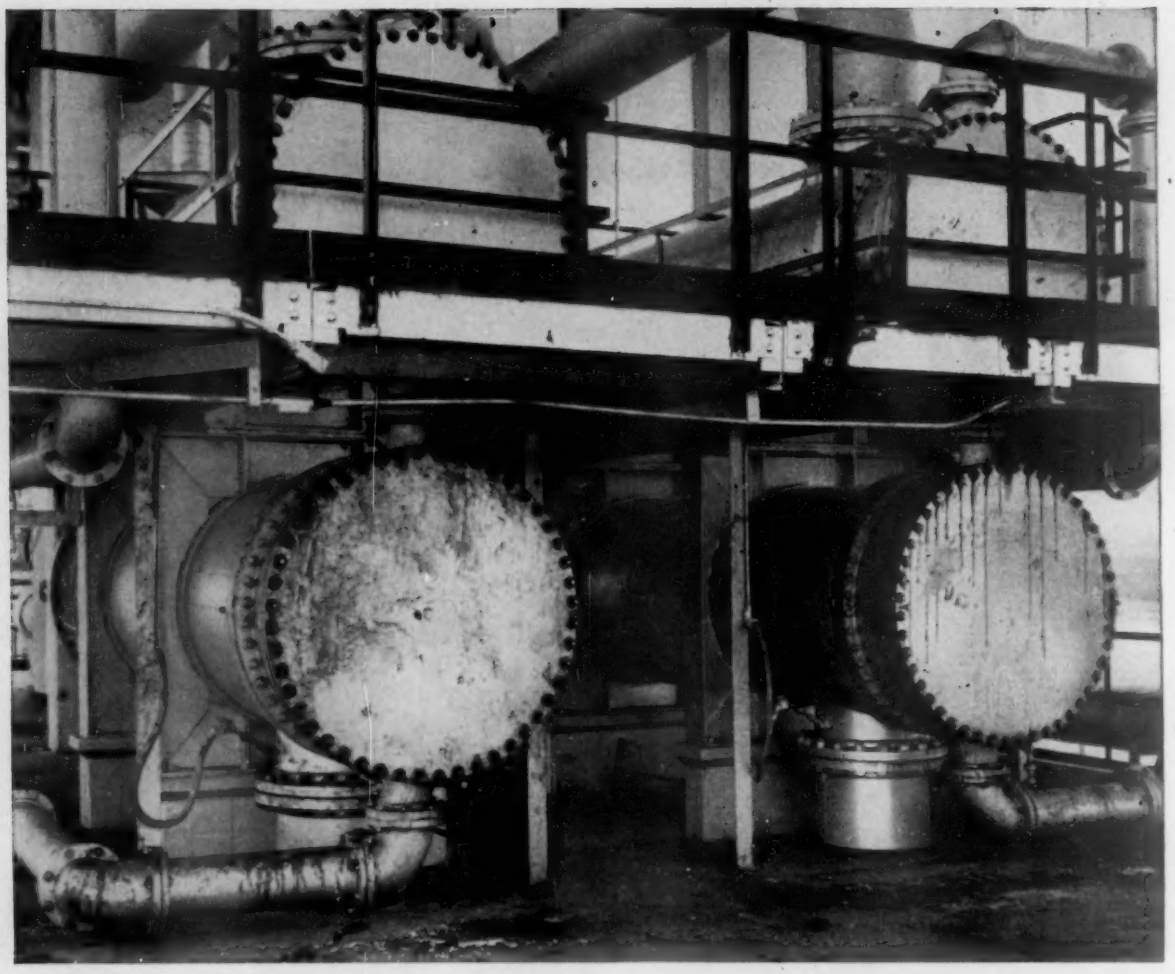
This week major refiners are acting promptly to comply with the Government's belated request to cut crude runs. The Government still hasn't asked state commissions to raise allowables—though the uninformed U. S. and European press fumes that this is the root of the trouble. Pipelines have rearranged routings about as much as possible without a specific Government authorization.

The industry has given first consideration to protecting supplies for its domestic customers. If it had not done that—if Europe had plenty of oil while the U. S. ran short—just imagine what the acrimonious outcry would have been.

When the dust settles it will be found that the industry and the oil states have complied with—and gone beyond—all official requests. The failure of all the actions to add up to as much oil as Europe expected must be laid to a combination of unavoidable circumstances—including such things as fog which delayed tanker turnarounds.

WASHINGTON CAN'T ESCAPE the blame, if blame there is. As of now, it would appear that the Government failed to provide the leadership, drive, and coordination implied in its bland promise to keep Europe supplied. It underestimated the difficulties involved.

The industry shouldn't take this whipping lying down. It should smite its critics with a full explanation of what it did and why it couldn't do more.



Creole finds No Measurable Corrosion of cupro-nickel tubing after 6½ years in salt water condenser

When designing a new refinery in Venezuela, the Creole Petroleum Corp. specified cupro-nickel tubing to assure long life for its salt water condensers.

After 6½ years' service at their Amuay Bay Refinery, inspection reports on 70-30 cupro-nickel tubing in overhead salt water condensers (top) showed *no* measurable corrosion, except for slight impingement caused by fouling.

Tubing in the crude-overhead partial condensers (bottom) also 70-30 cupro-nickel exhibited no corrosive attack.

Elsewhere in the plant, 90-10 cupro-nickel tubing in fuel oil cooler shows no measurable corrosion *after four years' service.*

If operating conditions cut the life of your tubes, and cut into profits as well, nickel-containing alloy tubes may be the solution to your problem. Write for 28-page illustrated brochure, "Alloys for Heat Exchange Problems." Tells you what alloys have been successful under severe operating conditions.

INCO TRADE MARK **THE INTERNATIONAL NICKEL COMPANY, INC.** 67 Wall Street New York 5, N. Y.

The Industry This Week

• **INDUSTRY:** Heaviest pressure yet is being put on oil industry by Washington to get more oil to Europe. The result: Refiners have started cutting runs, altering yields. Imports from Venezuela may switch to Europe. P. 62.

The A.P.I.'s hunt for a "Mr. Oil" to be the industry's voice in Washington has hit a snag. First offer went to Ed Gossett, former congressman of Dallas. He turned it down. The hunt for right man is still on. P. 64.

First toe hold in offshore oil has been gained by Seafarers Union. It signed 1-year contract with Phillips covering marine employes. P. 70.

• **PIPELINING:** Plans for that Four Corners-to-Los Angeles crude line have been firmed up. Partners are Shell, Socal, Gulf, Continental, Richfield, and Superior. But Texas-New Mexico insists it still will build line from same area to the southeast. P. 74.

Gulf Interstate is stepping out again in areas where it pioneered: Centrifugal compressors and automatic, remote-controlled stations. It plans biggest installation of engine-driven centrifugals in industry. P. 80.

Look for a feverish scramble to buy Trans-Canada stock. Waiting lists are building up with brokers in Canada and U. S. for $112½-million offering coming up this week. P. 72.

Israel is dealing behind the scenes in United Nations for support for a big-inch line bypassing Suez Canal. So far France is only major power to favor deal openly. P. 86.

Underground gas storage paid off handsomely during Southern California's January cold spell. Stored gas was called into play to meet tremendous peak demands. P. 72.

• **PROCESSING:** O.C.A.W. hints strike vote may be called in a move to force Sinclair to start negotiations on industry's only nation-wide contract. P. 68.

Chemical industry is charting a whopping $2.5 billion construction program for next 2 years. P. 68.

Work has started on $15-million program to give Alaska a 7,500-bbl. refinery and product-distribution system. P. 81.

• **PRODUCTION:** Highest wellhead pressure ever reported on a producing well has come from Union Oil & Gas Corp.'s well in Louisiana. It had shut-in tubing-head pressure of 11,600 psi. P. 66.

Demand for natural gas in North Dakota soon may outstrip state's production. P. 67.

Signal Oil has hit a new high in production-site beautification in California. When rigs moved off after drilling six wells, company created beautiful garden spot with pumps housed under patios. P. 71.

• **EXPLORATION:** A new firm, Trans-Gulf Offshore Drilling, may start a new trend with its first drilling platform. It plans a small, compact mobile unit which will cost $2½ million. P. 69.

Shell won't abandon its efforts to find oil in Qatar offshore area despite $2-million loss of drilling barge. P. 88.

Equipment is being shipped to the Greek island of Zante to explore a 120,000-acre concession. P. 87.

Explorers soon will have a new well-logging tool which logs the porosity of potential oil-producing formations. P. 82.

Crude Flow to Europe Will Climb Higher

- **Refiners cut runs, change yield patterns in attempt to make more crude available for export.**
- **Oil men would consider the pickup welcome, as most of the week's news was loaded with criticism of the industry**

WASHINGTON. — The much criticized oil-for-Europe program shows signs of improving. After feverish activity early last week during which the oil industry was kicked around in the capitol, these developments took shape:

... Refiners started cutting crude runs and altering yields. This will make more crude and fuel oil available for export.

... Hints came of a shift in Venezuelan oil shipments from the U. S. East Coast to Western Europe. Independent U. S. producers have long argued these imports have depressed domestic production in the crisis.

... Signs appeared in Texas that isolated wells are getting pipeline connections. If their numbers grow, it could lead to a new policy of the Texas Railroad Commission toward allowing greater production.

Time for a change ... Oil men felt the upturn couldn't have come at a better time. They were a bit groggy after:

... Eisenhower told a press conference Europe must not be left flat on its back for lack of oil. He declared the goal should be to supply all the oil that transportation can handle.

But the President dropped this veiled threat: The Government has certain powers it could use in the field of prorating oil production by states and controlling other activities of the industry.

... Congressional hearings, spearheaded by Senators O'Mahoney and Kefauver, quizzed the government officials on all aspects of the emergency program and the recent crude-price increases.

O'Mahoney blasted the oil-for-Europe program as a failure. He raised the monopoly issue by saying a few companies have too much voting power in the Middle East Emergency Committee. Kefauver upbraided the officials for not arranging to hold the line on prices during the emergency.

The program got warm defense and some explanation from Mobilization Director Arthur S. Flemming, Assistant Interior Secretary Felix E. Wormser, and Hugh Stewart, director of Interior's oil and gas office.

And from much criticized Texas came a defense of the industry and the Railroad Commission and counter accusations against the federal Government.

Refinery changes ... The refiners were the first to meet the Government's plea for renewed action.

Wormser last week asked them to cut back runs and alter yields *(The Oil and Gas Journal, February 4, page 80)*. He recommended a 200,000 bbl. daily cutback.

Esso Standard Oil Co. took care of nearly 25 per cent of this in one whack. Esso announced starting February 1 it would reduce its crude runs 48,000 bbl. daily from the January level.

Socony Mobil Oil Co. cut its runs 17,500 bbl. daily at two refineries—Beaumont and East St. Louis. This is on top of cuts made earlier. In addition, Socony plans to alter its yields to provide 250,000 bbl. more of No. 6 oil for export during the first quarter.

Sinclair Refining Co. cut runs 15,000 bbl. daily or 5.4 per cent below January levels. It plans to continue reduced operations at least through March.

Continental Oil Co. ordered a 5 per cent reduction in crude-oil runs. This represents a cut of about 7,500 bbl. daily. Continental also announced it plans to buy excess distillate stocks available in the Mid-Continent and move them to the Gulf Coast for export.

Humble Oil & Refining Co. sliced February crude runs to its Baytown refinery by 10,000 bbl. daily, about 4 per cent. Plant yields also are being changed to get more middle distillate.

Defender in Congress ... At least one congressman came to the defense of the oil industry and Texas Railroad Commission.

Rep. Frank Ikard of Texas said on the House floor that the Railroad Commission is primarily a conservation body, responsible to Texas statutes and "is not a free-wheeling, irresponsible organization accountable only unto itself."

Ikard said Texas law forbids waste of crude oil. This waste is defined as production in excess of market demand and transportation facilities. He added that the law requires the commission to allocate the demand for Texas crude fairly among various fields and wells of the state.

The congressman concluded: Under present conditions, the commission could not, without violating Texas law, have increased Texas allowable any more than has been done.

Ikard also defended the recent crude-price increases. He said the oil industry has not contributed to inflation in the past. Now it is only trying to recoup the costs of five increases in steel prices and four rounds of wage increases since the last price increase.

"A LITTLE MORE GENEROSITY" from the Texas Railroad Commission was asked by Hugh Stewart, director of the Office of Oil and Gas, at a press conference. Stewart said no thought is being given to government control of refinery operations.

What Texans say . . . Texas officials refused to take the blame for troubles in the oil-for-Europe program.

Members of the Railroad Commission and the governor all declared the trouble lies with the federal Government itself and the major oil companies. They argued the Government has permitted near-record imports to continue and the big companies have continued to run far too much crude to stills and produced too much gasoline. They claimed action on these two points would have diverted oil to Europe.

Gov. Price Daniel put it this way: "If the President wishes more production of oil in Texas, he should use the powers of his office to prevent excessive oil imports, and his power of persuasion to get gasoline refiners to reduce their excessive stocks."

Ernest O. Thompson, veteran member of the Railroad Commission, said the commission is required by law to consider stocks on hand of crude oil and all petroleum products when setting allowables.

Another commission member, William J. Murray, Jr., said Texas "would make oil available, as it has always done, to meet every demand either domestic or foreign so long as this oil can be produced ratably and nonwastefully."

The commission is scheduled to hold its regular state-wide hearing February 19 to set the oil allowable for March. In view of the statements by Thompson and Murray, it appears doubtful that any emergency order will be issued raising Texas output before that hearing. It also appears doubtful that the commission will raise the March allowable unless it shifts from its present position regarding stocks.

More shifts . . . Wormser gave the word of a shift coming in Venezuelan shipments to the U. S. East Coast.

In appearing before the O'Mahoney committee, Wormser declared he had been informed there will be a greater diversion of Venezuelan oil to Western Europe. He indicated this could influence the Texas Railroad Commission to increase allowables for the rest of the emergency.

Wormser said imports into this country from Venezuela would reach an average 800,000 bbl. daily this month. Officials are striving to divert much of this oil to Europe and replace its market with Gulf Coast oil.

Wormser and Flemming both told the Senate committee they respected the problems of the Texas commission. Both also stressed that they had no authority to force state authorities to step up production.

Stewart told a news conference he had no criticism of the Texas Railroad Commission but "would like to see them be a little bit more generous."

SUPPORT of the oil industry was voiced at a Senate subcommittee hearing by Arthur Flemming, left, outgoing director of defense mobilization, and Felix Wormser, assistant secretary of the Interior.

Flemming testified that the oil lift had succeeded better than any government effort could. He admitted he is disturbed over some phases of the effort. He cited failure of crude shipments to reach expected levels, failure of refiners to adjust runs and yields earlier, and continued import of Venezuelan oil.

Flemming said shipments to western Europe have averaged 475,000 bbl. daily from November 1 through January 23. That is only 25,000 bbl. daily less than the goal. But only 258,000 bbl. of the shipments were crude, he said. The rest was finished products. The volume of crude was far short of the goal and is the real problem now confronting Europe, Flemming added.

What about Texas? . . . Texans still contend pipeline bottlenecks are the main reason more oil isn't available for Europe.

Some suggest a remedy may lie in any of several drastic policy changes:

. . . Junking the traditional state-wide proration formula.

An across-the-board increase in Texas allowables would make more oil available for export. But it would build up huge surpluses in North, Central, and West Texas. Such a move likely would bring pipeline proration, limiting production where lines were unable to move all the oil.

Actually pipelines from West, Central, and North Texas to the Gulf Coast are full now.

A more direct approach would be regional proration by the commission. But this would in many cases pit independents against major oil companies, who control the pipelines.

Independents, who are thick in North, Central and West Texas, feel they have suffered long enough under competition from cheap foreign oil brought in by the majors. Now when there's oil to be sold for export, they want their share. They feel that the same companies which profit from imports would profit from exports unless the market is prorated equitably.

. . . Disregarding economics of crude transportation.

Some majors say there is no economic way to get much additional crude to gulf ports under the present statewide proration.

About 50,000 bbl. daily of crude now is going from West Texas northward to Wood River, Ill. From there it is shipped down the Mississippi to the gulf. This long—and expensive—flow could be increased perhaps by 10,000 to 15,000 bbl. per day.

Tank cars are another—and still costlier—means of getting more oil to tidewater. "If you get mad enough," one major-company spokesman remarked, "you can still transport oil from West Texas to the Gulf Coast by tank car." Apparently nobody in Texas is that mad.

Gossett family votes "no" as . . .

. . . A.P.I. Hunts A "Mr. Oil" For Capitol

DALLAS.—Six Texas children have outvoted directors of the American Petroleum Institute and upset a big piece of business in New York.

This interesting family story came to light last week. With it came the full revelation that the venerable A.P.I. is deciding on a sweeping basic switch in policy.

All through its history the A.P.I. has had this firm policy: Not to mix in politics. But Institute thinking on this issue is changing. Many now believe that was a mistake and it's time to broaden the industry's public relations.

New twist . . . The A.P.I., through the Oil Industry Information Committee, has worked hard to tell the general public about oil and the oil man's problems. But it hasn't tried to educate congressmen.

The industry now is under almost continuous investigation by Congress. Many of its decisions raise a hue and cry. Every price increase is suspect. The important depletion allowance comes under fire every session. And federal oil and gas controls keep getting tighter.

A.P.I. officials now think the reason is clear: Congressmen don't know the industry. Oil has no strong voice in Washington to speak for it as an industry.

So the A.P.I. recently made a far-reaching decision to open a Washington office. It would operate openly and legally as a lobbyist group. It would attempt to head off bad bills and push good ones. The goal was a better climate for oil in Congress.

Man for the job . . . The man to head this office, the A.P.I. felt, was all important. It finally chose Ed Gossett of Dallas.

The reasons for this choice are good ones. Gossett is a respected ex-congressman—and from an oil area. He now is general attorney at Dallas for Southwestern Bell Telephone Co. He also has his own private law firm, Gossett, English, Denman & Hall.

For 12½ years before joining Bell in 1951, Gossett served as a member of the House of Representatives from Texas' Thirteenth Congressional District (the Wichita Falls area in North Texas).

He made a great many friends in Congress before resigning. He still knows about two-thirds of its members. They would be apt to listen to him.

ED GOSSETT
. . . family votes for Texas

Furthermore, Gossett needs little tutoring about oil. Having represented an area where oil is the major factor in the local economy, he is thoroughly familiar with its problems.

He handled tidelands legislation before the judiciary committee of the House and played a key role in getting it passed overwhelmingly there on two occasions.

All in all, he appeared the ideal man for the job. The A.P.I. offered to make him vice president, general counsel, and chief of the projected Washington office.

Wrench in the works . . . But last week Gossett upset the apple cart. He notified the A.P.I. in New York that he was turning down the job.

The reason? The same reason he gave when he resigned as a member of the House of Representativs 5½ years ago. His family.

Gossett has six children, three boys and three girls. He left Washington in 1951 because he felt it had become impossible to do his duty as a congressman and have any time left for his family.

This time it was a family decision, too. He put the offer up to the children. They didn't want to leave Dallas. Gossett in discussing the offer with one of his sons mentioned that the A.P.I. job would mean more money. The boy told him: "Money isn't the most important thing, you know."

Gossett, however, turned down the offer reluctantly. Other than added income, he thinks, the A.P.I. offered "a challenge to do something well worthwhile."

He feels that setting up such an office is essential if oil is ever to escape its present role as a federal punching bag.

How now? . . . The A.P.I. remained silent on the matter while talking with Gossett.

Late in the week, however, it officially confirmed that the post of vice president and general counsel had been offered to Gossett. A spokesman said search for a man to fill the post will continue but he will not necessarily be offered the same title.

Huge Pipeline Deal Complete

HOUSTON.—El Paso Natural Gas Co.'s acquisition of Pacific Northwest Pipeline Corp. is complete.

El Paso has deposited for exchange 4,261,250 shares of its common B stock for 2,435,000 shares of Pacific Northwest in the 14 for 8 stock deal. The 2,435,000 shares of Pacific Northwest common was 81.4 per cent of its shares required under the exchange agreement. Remaining Pacific Northwest stockholders have until March 1 to accept the offer *(The Oil and Gas Journal, January 21, page 58)*.

Under terms of the purchase, El Paso boosted its board of directors from 12 to 17. Five Pacific Northwest board members were elected to the new posts. They are:

Ray C. Fish, chairman of Pacific Northwest and president of Fish Engineering Corp.; Alfred C. Glassell, Jr., Houston independent and former vice president of Pacific Northwest; Leon M. Payne, vice president, secretary and counsel for Pacific Northwest; Franz Schneider, director of Newmont Mining Co.; and Stuart F. Silloway, president of Pacific Northwest.

Signal to Use Earth Island

LOS ANGELES.—Signal Oil & Gas Co., as operator, will use an earth-filled, near-shore drill site for carrying out further development of this city's tidelands oil properties.

The new location will be directly seaward from the onshore site where six slant-drilled wells have been completed (see page 71). A 300-ft. causeway will be built to the site, which will be able to hold 24 or more wells.

Construction will start in about 2 months when the stormy season is over.

In announcing the city's approval of the plan, Signal also said it and Reserve Oil & Gas Co. have purchased Artnell Oil & Gas Co.'s interest in the project.

Leases Disputed

Federal Government claims land leased by Alabama

MONTGOMERY, Ala.—Alabama has granted oil leases on 232,000 acres in Mississippi Sound and the Gulf of Mexico. The leases include about 92,000 acres where the federal Government claims jurisdiction.

Successful bidder on the 61 leases awarded was Tidelands Development Corp., Dover, Del.

Announcement of the awards was made this month by State Conservation Director W. H. Drinkard after an unidentified oil-company representative had complained of the long delay in granting leases. Bids for the acreage were opened last December 20.

Drinkard said Magnolia Petroleum Co. was the only competitor for two tracks leased to Tidelands Development. Magnolia's bid provided a higher bonus, but Drinkard said Tidelands' offer will yield higher rentals.

Terms of the leases were not disclosed, but Drinkard said rentals might amount to $600,000 during the next 5 years. He said Tidelands had indicated it will spend about $2,000,000 for exploratory work on the block of leases.

The acreage extends as much as 9 miles into the Gulf of Mexico. The federal Government claims the Alabama boundary extends only 3 miles from shore. Drinkard said revenue from the disputed tracts will be kept in escrow pending settlement of conflicting claims.

Shell's History Published

NEW YORK.—"Enterprise in Oil," a history of the Shell Oil Co. in the United States, has just been published.

The 816-page book traces Shell's growth from its establishment in 1912. It started as a small West Coast marketing firm, American Gasoline Co., and a producing company in Oklahoma, Roxana Petroleum, and grew to today's billion-dollar company.

First chapters of "Enterprise in Oil" deal with the organization of Royal Dutch-Shell, then a new idea in business—a collaboration of companies each retaining its own identity and functions. It also discusses other oil companies to put Shell in its proper perspective in the industry.

watching WASHINGTON

. . . with Bertram F. Linz

FTC Loses Round in Discount Fight

A NOVEL point in antiprice discrimination law has been raised by a recent ruling of the Chicago federal court. It interests the oil industry because it parallels the issue in the Standard Oil Co. (Ind.) "Detroit" case.

The "Detroit" case involved this issue: Cutting prices to selected customers to meet competition. The Chicago case covers giving larger discounts for the same purpose.

The FTC ordered the company to stop giving higher discounts to favored customers. The company fought back, argued the ruling discriminated against it. Every firm in its industry gives such discounts to meet competition, it said, adding: To stop while others continued would be business suicide. So, it told the court the FTC properly should have ordered everyone to stop at the same time.

The FTC claimed it couldn't take such general action. It has to decide each case on its merits. But the FTC didn't tell the court that it has other ways of meeting the problem. One would be outlawing selective discounts through industry codes of fair practice.

The court upheld the company's contention the order was unfair. That probably opened the way for a Supreme Court test of the issue. FTC legal minds plan to appeal and are confident the ruling won't stand up.

Showdown Shapes on Public Lands Row

THE Defense Department is fighting hard for one power: To withdraw oil lands for military purposes.

Officials indicate they would like to make a pact with the Interior Department. Interior is fighting equally hard to keep the oil areas of the outer Continental Shelf open for development.

The Navy, which is yearning for new oil reserves, might forego a claim that it has a right to drill for oil on any land under its control. That claim was the basis of the whole hassle now going on over alleged land "grabs" by the military.

Defense spokesmen have hinted they might be willing to let Interior retain oil rights on lands taken over for training purposes. But in return they would want veto power over leases granted on them.

Oil Men Beat Path to Washington

CONGRESSIONAL committees will stumble over each other this year in efforts to probe the oil industry. And oil men will do a lot of traveling to Washington as a result.

It's not a new occurrence. Back in 1948 something over a dozen studies were sparked by the East Coast fuel-oil shortage. This year bids fair to rival that record. Just take a look:

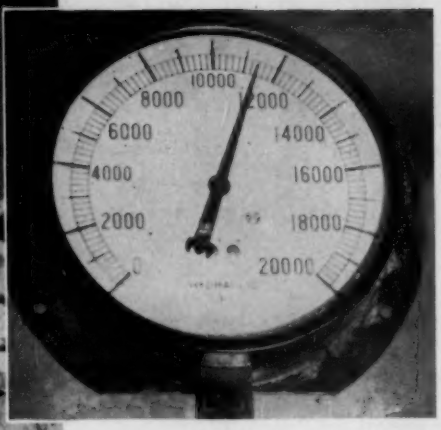
The Senate has given its judiciary committee $225,000 for a study of the Middle East situation. The commerce committee has $50,000 for an inquiry into transportation, marketing, and distribution.

The commerce committee also has $225,000 for its routine work. This covers oil and gas among other things. And the interior committee has $180,000 for its area. That includes fuels and public lands.

The House has been a little slower getting its probes started. Plans for several inquiries were held up in a fight over jurisdiction. It was proposed that no committee should make an inquiry on any subject already being investigated by another group. Since one phase or another of oil is covered by a number of committees, the idea of course didn't get a very hearty reception.

In addition to the probes of the oil-to-Europe program and price hikes, at least five other studies of the oil industry have been proposed.

All told, it looks like a busy session.



Here's the first gage ever to register 11,400 psi. on a well. After testing, it moved higher

Union conquers record pressure:

Well Gages 11,600 Psi.

JENNINGS, La. — A producer with the highest wellhead pressure ever known has been completed by Union Oil & Gas Corp. of Louisiana.

It's the 2 Elue Roach with shut-in tubing-head pressure of 11,600 psi.

The new gas-condensate producer opens a new pay on the southwest side of Union's spectacular Lake Arthur field in Jefferson Davis Parish. Top of the sand is 15,130 ft. It extends to 15,308 ft. Total depth is 15,461 ft.

The well tested 190 bbl. of condensate and 6,375,000 cu. ft. of gas daily, flowing through 1¼-in. tubing with 10,300 psi. At a rate of 8,000,000 cu. ft. daily through the small tubing, wellhead pressure pulled down only to 9,900 psi.

Although bottom-hole pressure has not been measured, a good indication was given when the sand was being drilled. The well "kicked" a 17.8-lb. mud; and it took 18.0-lb. per galllon mud to continue drilling. On this basis the company engineers estimate reservoir pressure is about 14,000 psi.

Union was prepared . . . Only a few years ago, oil companies were refusing to complete wells of much less pressure than the 2 Elue Roach. There simply wasn't any proved equipment that could be depended on to hold 10,000 psi. or more continuously.

However, with the development of higher-tensile-strength tubular goods, higher-test wellhead connections, and Union's method of completion, there is now reasonable assurance that wells in this pressure range can be handled.

This assurance was felt by Union in 1953 when the drilling and protective casing programs were planned so that a high-weight mud could be carried without too much danger of losing circulation and inducing a blowout.

Strings of the newer high-tensile-strength P-110 and P-105 casing and tubing were designed strong enough to hold the pressure. And they were tested not only at the mill but also on the rack before being run into the hole.

When it was placed on the well, the 30,000-psi. christmas tree was tested at 15,000 psi.—its working pressure. As it has in other high-pressure wells, Union hung a string of 1¼-in. macaroni tubing inside the regular 2½-in. tubing.

This small-diameter string not only makes it relatively easy to kill the well by pumping heavy mud down the 2½-in., it also keeps flowing pressures low. Highest flow rate through the 1¼-in. to date has been 14,900,000 cu. ft. per day. At this rate, flowing pressure came down to 5,100 psi.

An added advantage of the 1¼-in. string is that corrosion inhibitor can be injected into the 2½-in. string while the smaller one continues to produce.

Moreover, the operator can wash the well in for completion after all wellhead fittings and the christmas tree have been installed and tested.

The company couldn't predict beforehand exactly what pressure a formation at 15,000 ft. in Lake Arthur would have. But everything yet drilled below 9,000 ft. in the field has had an abnormal pressure. So, the 11,600-psi. wellhead pressure was no great surprise, and Union was ready for it.

At the same time as the Roach operation, Union completed its 3 Van Geffen which extended Lake Arthur ½ mile northeast. This well logged the Main Camerina sand at 12,642-12,921 ft.

Union's lease block has now proved productive in more than 5,300 acres. The company currently has two contract rigs drilling in the field.

Union Sulphur & Oil Corp. (later named Union Oil & Gas of Louisiana) discovered first production in the area in 1937. The structure is faulted and associated with a deep-seated salt dome.

Present deep play got under way in January 1953 when Union completed the A-1 Walker. This gas-condensate producer tapped the Main Camerina from 12,390 to 12,410 ft. Closed-in surface pressure was 8,350 psi.

Cased to prevent loss . . . Union spudded the Roach well last September 16 and cemented 13⅜-in. surface pipe at 2,025 ft. It drilled the hole without difficulty to 12,322 ft., then ran an intermediate string of 9⅝-in.

When the hole reached 15,000 ft. it had to be cased, although it was still not as deep as Union planned to drill. With the high-weight muds made necessary by the abnormal-pressure formations, there was too much danger of losing circulation in a long section of uncased hole. And if circulation were lost, the well might easily blow out.

To meet the need for casing, Union ran a 7-in. liner extending to 15,002 ft. from a hanger at 10,113 ft. inside the 9⅝-in. This liner sealed off the open hole and could be extended to the surface as a complete production string when required.

Union has used this liner technique in other Lake Arthur wells and finds it desirable. It permits completion with

a production string, the top of which is new and has not been drilled through.

With the 7-in. liner in place, drilling continued to the new pay sand. Then the well kicked and mud weight was raised from 17.8 to 18 lb. per gallon. When the hole reached total depth of 15,461 ft., Union ran a liner of 5-in. P-110 pipe.

While Union intended to set it on bottom, the liner stuck in the pay sand and couldn't be freed. So, it was cemented there. Bottom of the liner is at 15,224 ft. and the pay extends from 15,130 to 15,308 ft.

Before drilling the plug on the 5-in., Union completed the 7-in. liner and cemented it completely to surface. This completion string was P-110 of designed weights, the heaviest being 35 lb. per foot.

The 7-in. pipe was P-110, having a minimum tensile yield strength of 110,000 psi. It was threaded with Speedtite joint and tested hydraulically on the racks to 80 per cent of its minimum yield.

Mud above packer . . . After the 7-in. was completed to surface, Union drilled the plug on the 5-in. liner and cleaned the hole through the prospective pay. No attempt was made to perforate the sand body behind the liner; production was to come only from the open hole below.

Then the company ran a combination string of 2-in. and 2½-in. integral-joint P-105 tubing with Hydril type CS and type PH6 threads. It was set on a Jack Edwards packer inside the 5-in. at 15,155 ft. The 10-lb. mud was left behind the tubing as packer mud.

As the tubing has to hold well pressure, it was rack tested to 80 per cent of minimum yield, just as was the casing. Each tubing coupling was tested with the Loomis tool as it was run.

The string of 1¼-in. macaroni tubing with Hydril type CS threads was rack tested to 80 per cent of minimum yield and hung without packer to 8,519 ft.

Tree tested, too . . . The tree on the 1 Roach is equipped with Grayloc high-pressure couplings and Cameron ram-type head and WKM valves.

The tree has 2 WKM balanced-stem master valves and a like crown valve. It has a single tubing wing with a single wing valve and an A-1 high-low-pressure shut-in valve. The tubing wing also carries a positive choke and an adjustable choke.

In addition, there are two WKM balance-stem valves on the 1¼-in.-2½-in. annulus.

When the well was ready to bring in, a plug was screwed into the base of the Gray tubing hanger and 15,000 psi. was put on the tree by Halliburton cementing pumps. When the tree passed this test, the plug was removed and the Halliburton pumps began to circulate water down the 2½-in. tubing and out the 1¼-in.

Before much water was displaced, the well began to unload itself. In short order, it cleaned itself of mud and the crew got a look at the first wellhead gage ever to register 11,400 psi. (photo).

After the rig was moved off and the well had flowed several days on test, the record 11,600 psi. showed itself.

Through three chokes . . . The positive choke on the Roach well is sized so that it does not seriously restrict flow; it is merely for safety in case the downstream adjustable chokes cut out.

The adjustable choke on the wellhead pinches flow to about 4,500 psi. on the flowline to the heater. When the well was flowing at the 6,375,000 cu. ft. per day Union figures the combination of positive and adjustable chokes was about equivalent to a single 12/64-in. choke.

After flow goes through the heater, a second adjustable choke cuts flow to pipeline pressure of 1,500 psi.

Little string already tried . . . In 1947 at Branch field, Louisiana, Union had a high-pressure well develop a downhole leak.

Of course, the leak had to be fixed, but because of the pressure, Union couldn't kill the well by pumping down the tubing. So, the company had to snub a string of 1¼-in. pipe into the hole. With this in place, mud was pumped down the 1¼-in. tubing and out the 2½-in. The well was quickly killed and it was soon back on production.

Union's production men decided it would be much better to put a string of the 1¼-in. in the well when it was first completed. Then there would be no need for snubbing it in later. Snubbing pipe into a high-pressure well is both costly and dangerous.

Thereafter Union tried the 1¼-in. flow string inside the 2½-in. tubing while equipping wells in Branch field. Expecting abnormally high pressure sands at Lake Arthur (South), Union had a completion method which had already been tried and proven. The 1¼-in. made killing the well easier, completion safer, kept surface pressure low, and simplified corrosion control.

For these reasons, Union made the 1¼-in. macaroni string regular practice at Lake Arthur.

Corrosion controlled . . . As with its other wells, Union expects to inject enough corrosion inhibitor into the Roach well to keep iron content of produced water below 50 parts per million.

When the inhibitor is injected down the 2½-in. tubing, it will circulate down the well and back up the 1¼-in. This protects both strings without interferring with production out of the 1¼-in.

Union regularly inspects the valves and fittings on the christmas trees of its high-pressure wells for signs of corrosion or abrasion. Following the peak flow season last year, Union killed one well and pulled the 1¼-in. tubing. There was no evidence of corrosion or abrasion.

This regular inspection will also be a part of producing the 11,600-psi. Roach well.

Gas Strife Brews

Demand soon may outstrip North Dakota's production

MINOT, N. D.—Demand for natural gas in North Dakota communities is threatening to outstrip the state's production.

Montana-Dakota Utilities Co. in a special report last week said that communities it serves already consume 84 per cent of the gas produced in the state. The utility buys gas processed at the Tioga plant operated by Signal Oil & Gas Corp.

Montana-Dakota added that "based on present rate of growth the communities will soon require more gas than the state is currently producing." It gave these statistics: 6,289,795,000 cu. ft. of gas purchased last year at the Signal plant and 5,394,442,000 cu. ft. delivered to North Dakota customers. This leaves a margin of 895,353,000 cu. ft. for growth.

The further development of new markets in Minot, Williston, and other cities served will require larger volumes, the utility said. On peak winter days last year and several times when the Tioga plant was shut down for repairs, gas was moved in from Montana and Wyoming.

Montana-Dakota's statement came at a time when public officials have stepped up a drive to extend gas service eastward to Fargo and Grand Forks. The Tioga Chamber of Commerce has indorsed a resolution now before the legislature asking for a survey of North Dakota-produced gas being moved out of state. The State Industrial Commission has been at odds with the utility for months over extending its system and the price it pays for gas *(The Oil and Gas Journal, July 23, 1956, page 67).*

Strike Threat Hurled

O.C.A.W.'s Knight hints strike vote imminent as Sinclair refuses to open talks; Indiana Standard turns down offer

A STRIKE threat looms in the Sinclair Oil Corp. labor picture.

The Oil, Chemical, and Atomic Workers Union, which holds the only nation-wide contract in the industry, has asked Sinclair to set a date for discussing wage increases. No date has been set and it appears unlikely that talks will start in the immediate future.

O.C.A.W. President O. A. Knight has stepped into the picture and is publicly talking about a strike vote.

According to union sources, a meeting took place January 10 following O.C.A.W.'s announcement on wage demands December 7. At that time the union suggested talks begin in Kansas City January 22. But Sinclair declined to talk then and the company says that the status on the talks is unchanged. In other words, indefinite.

The Sinclair rebuff is the second major setback O.C.A.W. has received since it launched a nation-wide campaign 2 months ago to get a wage increase for its 105,000 members.

The union approached Standard Oil Co. (Ind.) with a demand for an hourly wage increase of 27 cents. Indiana Standard refused the offer and shot back with a counter offer of 3 per cent or about 8 cents an hour. The union rejected this proposal. No date for additional negotiations has been announced.

In rejecting the Indiana Standard offer, O.C.A.W.'s Knight urged all 600 union bargaining units to "begin negotiations in earnest."

The new Federation of Independent Oil Unions was involved in the Indiana Standard negotiations with O.C.A.W.

Sinclair hassle . . . According to Union News, the O.C.A.W. house organ, Knight has written M. E. Stone, Sinclair's director of industrial relations, asking that he reconsider and set a date for wage negotiations. Knight added that if no action were forthcoming, the union would have no alternative to calling a strike vote.

O.C.A.W.'s Sinclair nation-wide council meets in Tulsa, February 22-23. To date there are no indications that any further talks with Sinclair will take place prior to that date.

While the contract runs to June 15, a wage reopener permits the union to exercise its right to strike prior to expiration date. However, the union must give 15 days notice.

Sinclair says its position is unchanged. A number of factors are involved in opening wage negotiations at this time. Not the least of which is the recent request from Washington to avoid further inflationary moves through general wage advances. The next move appears to be up to O.C.A.W.

Indiana situation . . . The 3 per cent offered by Indiana Standard is well below the minimum of 10 per cent or 25 cents an hour set by Federation's governing board last November *(The Oil and Gas Journal, December 3, 1956, page 72).*

Two members of the Federation represent Indiana Standard employes. They are the Central States Petroleum Union and the Independent Petroleum Workers of America (Whiting, Ind.).

Both groups have rejected the offer. Central States has resubmitted a brief, asking for the 10 per cent wage increase set forth by the Federation.

Leo Martin, Ponca City, Okla., secretary-treasurer of the year-old Federation, said wage negotiations between other independent groups and companies have not come to a head yet.

The Federation was formed to protect independent unions from being gobbled up by the O.C.A.W. Federation membership totals about 30,000—mostly in the Mid-West, the South and Southwest. Central States is the largest single affiliate with about 7,500 members. The Independent Petroleum Workers of America has about 6,500 members. The O.C.A.W. has only a few members involved in the wage negotiations with Standard of Indiana.

Giant building program set:

Chemical Industry Grows Fast

NEW YORK.—The chemical industry will spend a whopping $2½ billion on new construction during the next 2 years.

This more than doubles the record $1.16 billion spent by the industry during 1956.

The Manufacturing Chemists' Association, Inc., bases its new estimates on a survey of 327 companies. Broken down, the figures show that:

. . . Now under construction are 278 projects. They will cost nearly $1.8 billion.

. . . In the planning stage are 128 more projects. These will cost another $717 million.

Lumping 1956 construction with plans for 1957-58, Texas leads all other states in the building program. Total value of 81 projects in that state is $639,961,000. Louisiana ranks second with a 3-year building program costing $378,660,000.

The U. S. Department of Commerce is even more optimistic about the industry's future spending: $2.6 billion during 1957.

Cost of construction in 1956 was estimated at $1,468,000,000 — much higher than the Manufacturing Chemists' estimate.

Construction reached a peak in 1956 even though there were restrictive credit conditions and a marked cutback in fast tax writeoffs.

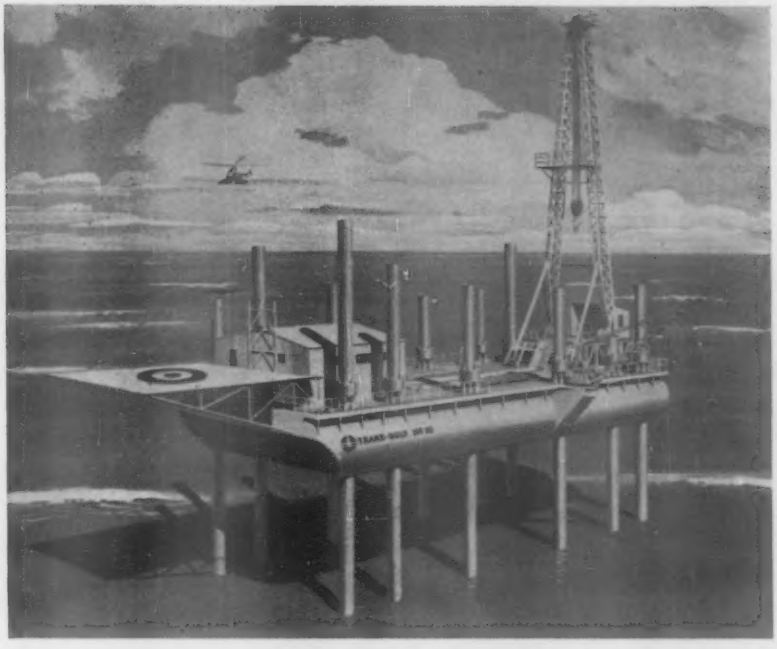
The continuing tight money situation will not slow down the building program very much. This is because of the greater use of retained earnings for capital outlay and the very severe competition in the industry.

Production, too, is expected to climb in 1957, with the Government expecting a 4 per cent increase over 1956.

The Chemical Industry's Big 1956-58 Building Program

(By thousands)

Category—	Planned	Under construction	Completed	Total
Fertilizer chemicals	$74,525	$130,420	$201,900	$406,845
Inorganic chemicals	247,889	361,450	206,700	816,039
Organic chemicals	184,567	366,992	310,481	862,040
Metals	46,000	288,697	130,950	465,647
Petroleum and natural gas	48,500	18,050	29,061	95,611
Plastics and resins	24,700	245,720	124,197	394,617
Synthetic rubber	30,000	156,300	23,750	210,050
Textile fibers	26,200	177,000	75,700	278,900
Miscellaneous	20,000	.....	16,000	36,000
Laboratories	15,650	37,275	42,450	95,375
Total	$718,031	$1,781,904	$1,161,189	$3,661,124



New, compact design—by a newly formed company

Single-Hull Unit Due This Fall

HOUSTON.—A new firm, Trans-Gulf Offshore Drilling, Inc., will build a streamlined drilling platform which may start a new trend in compactness and economy.

Designed for operations in water as much as 70 ft. deep, the mobile unit will be only 185 ft. long and 87 ft. wide. Fully equipped, it is expected to cost between $2,500,000 and $2,750,000. By comparison, Kerr-McGee Oil Industries, Inc.'s huge Kermac Rig 46 is 202 ft. long and 242 ft. wide. Kermac's barge is the largest now operating.

Port Houston Iron Works, Inc., will build the unit. It is due to be finished by August 1.

The Trans-Gulf platform will have only a single hull. Most of the machinery other than the draw works, substructure, and derrick will be inside the hull.

Trans-Gulf was formed last December by a group of men experienced in drilling and marine operations. Its main office is in Houston.

President of the firm is Drennan O. Wade, one of the owners and operators of Wade Towing Co. and Yount-Wade Drilling Co., Inc. Harry J. Chavanne, Trans-Gulf, chairman, formerly was a partner in Prince Drilling Co.

William H. Flynn, vice president, formerly was a design engineer for J. Ray McDermott & Co., Inc. He designed the proposed platform with the help of Dr. Wendell H. Nedderman, associate professor of civil engineering at Texas A. & M. College. Dr. Nedderman is a director of the new company.

Other directors include Ben S. Robinson, former partner in Prince Drilling Co., and Douglas W. Wade, co-owner of Wade Towing Co. and Yount-Wade Drilling Co. Douglas Wade, a brother of the Trans-Gulf president, is secretary-treasurer.

Officials said the company plans to do only contract drilling at first. Later, they said, it may drill on its own account.

The platform will be supported on location by 12 steel piles, each 48 in. in diameter. Hydraulic slip-type jacks made by Joe Stine, Inc., will raise and lower the legs. They will be adapted from the jacks used on a Mene Grande Oil Co. barge for operations in Venezuela.

Plans call for use of a diesel-electric rig capable of drilling to 20,000 or 25,000 ft.

Deck area of the new platform will be smaller than that of some units designed for much shallower water. A two-story building will provide quarters for 46 men.

The Trans-Gulf platform is designed to operate in water from 12 to 75 ft. deep. During the hurricane season it will be limited to water depths of 60 ft. or less.

Industry briefs

A four-company combine has been formed to search for oil in the California tidelands. They are Anderson-Pritchard Oil Corp., Bandini Petroleum Co., Southern California Petroleum Corp., and Climax Molybdenum Co.

Canadian Husky Oil, Ltd., has completed acquisition of Husky Oil & Refining, Ltd., in a stock-exchange deal. No management or operational changes are planned at Husky Refining, which will now tack Canadian onto the front of its name.

Canadian Husky Oil has owned 60 per cent of voting shares in Canadian Refining since 1935. The latter firm grew from a single refinery in 1947 to a fully integrated company operating throughout western Canada.

Doeskin Products, Inc., the facial tissue manufacturer, has branched out into the oil business. The company has purchased Keta Gas & Oil Co. from Swan-Finch Gas Development Co. in a stock-exchange deal.

Margaret, a drilling barge capable of operating in 65 ft. of water, is ready to go to work for Ocean Drilling & Exploration Co. in the Gulf of Mexico. The barge, costing $3.5 million, is 300 ft. long and 200 ft. wide. It was built by the Alabama Dry Dock & Shipbuilding Co. at New Orleans. Ocean Drilling has three other barges operating in the gulf.

The Wyoming House of Representatives has killed a bill that sought to levy a 2½ per cent gross production tax on depletable resources, including oil and gas.

Rep. John Wold, a consulting geologist from Casper, led the battle against the measure. He pointed out that 95 per cent of the proposed tax was aimed at the oil and gas industry. Wold reminded his fellow lawmakers that growth of the industry in Wyoming has resulted from the state's liberal taxing policies.

Stockholders of Kirby Oil & Gas Co. and Venezuela Syndicate, Inc., have approved sale of the companies' assets to the new Kirby Vensyn Petroleum Co. The new firm has also taken over many properties held by the C. W. Murchison family of Dallas. Murchison trusts will hold about 20 per cent of the stock in the new company. Kirby Oil & Gas and Venezuela Syndicate are being dissolved.

PACKED HOUSE at M.I.T. conference reveals . . .

Science Packs Popular Appeal

TULSA.—One technical school has a science show on the road that's packin' 'em in.

Massachusetts Institute of Technology brought its twice-a-year production to Tulsa last week and drew a capacity house. Attending were young students interested in science, their teachers, plus technical people of the oil and allied industries.

M.I.T. officials were pleasantly surprised at the large turnout. They were aware of the scientific curiosity of oil men. But the youthful interest in science in the Southwest was an unknown factor.

More than 400 students attended the 1-day meeting. They were augmented by about 800 technical men from the oil industry. The program included morning and afternoon sessions interspersed with a luncheon and dinner.

This is the first M.I.T. scientific conference staged this year. Another will be held later this month in Chicago. Only two are held each year, but the school has been staging them now for 5 years.

DR. JAMES R. KILLIAN, JR.
. . . scientific ringmaster

The idea . . . The conferences have become a vehicle for arousing interest in science. But that's not their main work.

M.I.T. President James R. Killian, Jr., outlined three objects of the program:

. . . Interest young people in scientific careers.

. . . Provide a rallying place for M.I.T. graduates.

. . . Let the M.I.T. graduates and technical men in industry know of latest scientific thinking at the school on various fields.

It's not a recruiting stunt for the college. Killian said M.I.T. has no enrollment problems. For each freshman class at the school, there are 15,000 inquiries, 4,000 firm applications, and room for only 900 new students. M.I.T. is in the position of picking the students it believes will benefit most from the particular programs offered there.

Killian said M.I.T. faculty felt the conferences might arouse in young people who attend a desire to take technical courses in a school nearer their home.

The speakers were top-drawer. They included Drs. Jerrold R. Zacharias, director of the M.I.T. laboratory for nuclear science, and John G. Trump, professor of electrical engineering. They talked on phases of atomic energy. Dr. Warren K. Lewis, professor emeritus of chemical engineering, talked on future of engineering at the luncheon.

In the afternoon Dr. Robert R. Shrock, chairman of the geology department, and E. P. Brooks, dean of Sloan School of Industrial Management, spoke. Dinner speakers were Dr. George R. Harrison, dean of science, and President Killian.

Union Enters Gulf

Marine employes get first oil contract from Phillips

NEW ORLEANS.—The Seafarers International Union of North America has established its first foothold in the offshore oil industry.

The A.F.L.-C.I.O. affiliate obtained a 1-year contract covering about 50 marine employes aboard Phillips Petroleum Co. vessels. It is the first such contract for seamen working on oil-company production vessels or drilling tenders in the Gulf of Mexico.

The contract covers deck hands and engineers on boats operated by the company's production department as well as marine engineers, deck hands, and able seamen on the drilling tender.

A union spokesman said benefits under the new contract, including shorter work hours, are equivalent to about a 30 per cent wage increase.

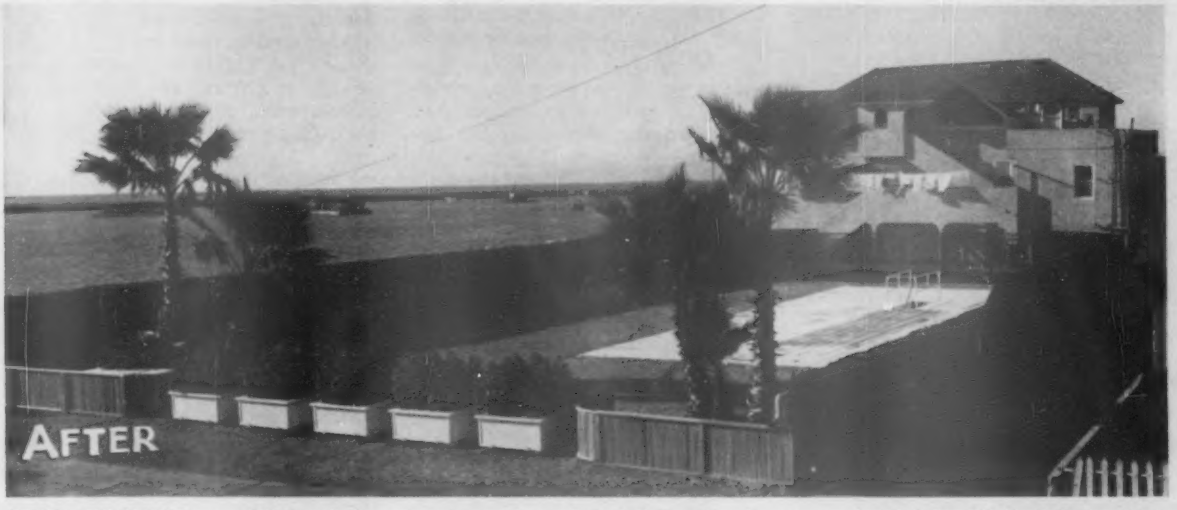
Terms . . . Under the new contract, marine employes aboard production vessels will be on duty 7 days and off 7 days. Previously, they were on 14 and off 7. Those on the tender will work an 8-hour day instead of 12 hours as in the past. They will continue the old schedule of 10 days on and 5 days off.

Other provisions call for double pay for work done on seven annual holidays and continuation of a 2-week paid vacation each year.

The Seafarers union was certified as bargaining agent of the group last November 13 following an election conducted by the National Labor Relations Board. A union spokesman said the S.I.U. won representation rights by a 3-to-2 margin.

The union's first major effort to obtain representation rights in the offshore oil industry backfired last summer when California Co. seamen voted against any union affiliation.

ONCE-INVITING REDONDO BEACH, battered in recent years by the rampaging Pacific, looked like this before Signal Oil moved in.



AFTER SIX WELLS were drilled and the company moved out, it looked like this. Pumps were installed beneath "patio." See below.

West likes beauty best, so . . .

. . . Drill Site Spruces Up

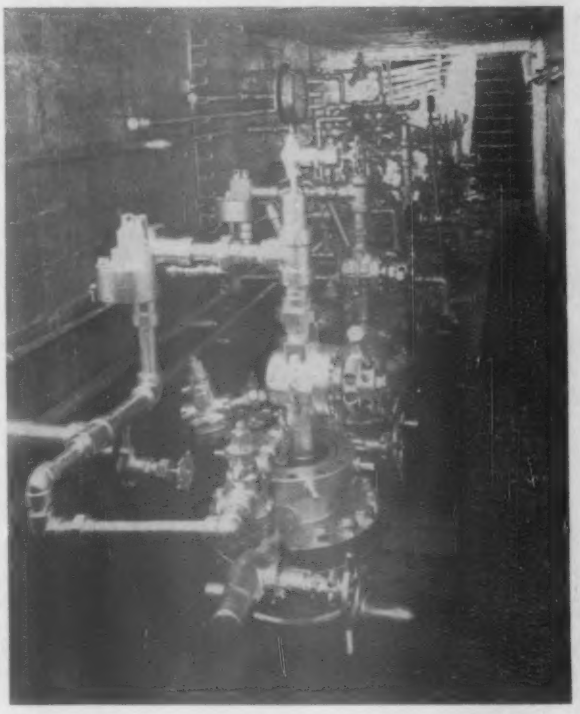
REDONDO BEACH, Calif.—As long as it brings in a royalty check each month, the sight of the plainest, most unadorned oil well is beauty enough for most people. But not so in scenic southern California, where residents might well lay claim to "the world's most beautiful drill sites."

When Signal Oil & Gas Co. moved off location here after drilling six wells recently, it left ample evidence of a trend which is becoming an accepted thing. In only 5 days the rig was moved off and the surf battered area converted to the garden spot pictured above.

Signal wasted no time in launching a beautification program which turned the location into a "garden spot" which should please even beauty-conscious Californians.

For years, California operators have found promising areas "off limits" to the drill because residents don't like the looks of rigs and pumps. So oil men have been doing what Signal did to get around the objections.

The beautification programs are making a dent, but they are not solving the problem completely. Even Signal had to move. The city will permit the company to continue drilling, but it must do so from beyond a breakwater now under construction. Signal will wait until after the storm season to decide on what to do.



Trans-Canada Cleared

Final construction approval replaces conditional permit as finances jell; public stock offering set this month

OTTAWA.—The scramble for Trans-Canada stock is on.

Waiting lists were building up fast, both in Canada and the U. S. last week with the news that final approval has been issued for the 2,250-mile line to move Alberta gas to eastern Canada.

A public offering of $112,500,000 worth of debentures and common stock will be made by February 15, with Canadians getting first crack at $81,250,000 of it. The remaining $31,250,000 will be offered in the U. S.

Stockbrokers all across Canada, particularly in Alberta, were saying their allotments would not come close to meeting demand. One Calgary broker said his firm's quota is expected to be less than 10 per cent of what it could sell.

In Tulsa, a leading broker described the demand in the U. S. as "chaotic, as bad as it was when Ford Motor Co. made its first public stock offering." He said his firm had applied for a big block of Trans-Canada stock, but had received no assurance that any of it would sift down to the Tulsa level. He said he could probably sell the entire offering himself.

Trans-Canada's final construction permit wiped out the last hurdle facing the $375,000,000 project. It includes construction of a 49-mile spur from Winnipeg to the Manitoba-North Dakota border at Emerson for shipment of gas to the U. S. This section hinges on Federal Power Commission approval of Canadian gas imports into the U. S.

Gathering system go-ahead . . . Trans-Canada has contracted with Alberta Gas Trunk Line Co., Ltd., to gather and transport gas to the Alberta-Saskatchewan border where Trans-Canada originates. The contract, to run for 25 years, calls for construction of a gathering system over a 4-year period until it is capable of delivering 620,000,000 cu. ft. daily. The time table is:

. . . 1957—Bindloss field and the Provost area will be connected.

. . . 1958—Sibbald, Oyen, Cessford-Sunnynook, Princess-Patricia, Atlas-Buffalo, and Pincher Creek will be linked to the system.

. . . 1959—Nevis field will start supplying Trans-Canada.

. . . 1960—Homeglen-Rimbey, Gilby, and Countess-Duchess will be tied in during the final stage of construction.

Dutton-Williams Brothers, Ltd., has already designed and engineered the system. Work is under way on the Red Deer River crossing which should be completed next month.

Completion date . . . Trans-Canada will have until December 31, 1958, to complete the line. More than 230 miles of the 574-mile Alberta-Winnipeg leg is already in, with completion of the section set for August or September.

The company expects to have 1,300 miles of pipe in the ground by the end of 1957. Pipe stringing is going ahead during the winter months, but construction is held up until summer.

Trans-Canada has held a conditional permit for 2 years, but the deadline for showing proof of financial ability had to be set back five times.

Government aid . . . In another development, the Canadian Government authorized the start of construction on the $120,000,000 northern Ontario leg. This will be built by a crown corporation financed jointly by the federal and Ontario provincial governments. The section will be leased to Trans-Canada, which will have an option to purchase when finances are available.

Trans-Canada's financing picture is completed by $104,000,000 in first mortgage bonds, with commitments on these from Canadian and U. S. investors, a $20,000,000 bank loan on pledge bonds, and $15,500,000 put up by sponsors of the line.

For California's cold wave . . .

. . . Stored Gas Is Ace-in-Hole

LOS ANGELES.—Underground gas storage paid off handsomely during southern California's January cold spell.

The two gas companies serving Los Angeles and adjacent cities made record sendouts on each of three successive days late in January. On January 28 the sendout totaled 1,969 million cubic feet. That was 200,000 M.c.f. more than on the previous day. Temperatures rose slightly the next day, but the sendout soared to 1,977 million cubic feet.

The underground reservoirs were called into play. They are operated by Pacific Lighting Gas Supply Co., for two subsidiaries, Southern California Gas Co. and Southern Counties Gas Co. They supplied 427,000 M.c.f. of the January 29 demand. On the previous day withdrawals from storage totaled 487,000 M.c.f. But the reservoirs could have supplied about 400,000 M.c.f. more had it been necessary.

Where gas came from . . . Peak-day withdrawals from underground storage largely were supplied from La Goleta reservoir near Santa Barbara.

It contributed 322,000 M.c.f. Playa del Rey and East Whittier storage units, also immediately available for meeting peak demands, added 69,000 and 36,000 M.c.f. respectively.

Other gas sources for the January 29 record sendout when Los Angeles temperatures averaged 45° were: Out of state gas, 844,000 M.c.f.; regular California gas sources, 531,000 M.c.f.; and "peaking" gas from southern California oil fields, 175,000 M.c.f.

The critical hour . . . Peak hour during the cold snap was 8 to 9 a.m. on January 28.

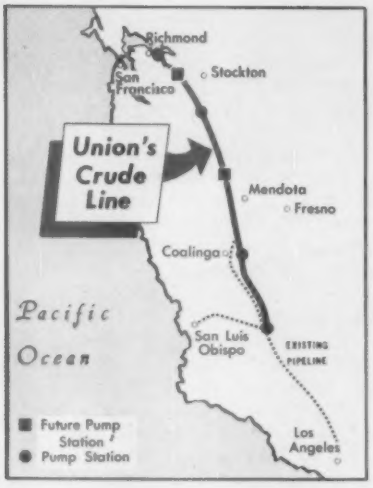
At that time gas was being sent out at an hourly rate of 106,667 M.c.f. Gas withdrawals from storage during the 1-hour period were 25,800 M.c.f. Out-of-state gas required was 42,900 M.c.f. California gas fields contributed 27,500 M.c.f., and gas holders added the remaining 10,700 M.c.f.

To supply this record demand it was necessary to curtail all service to interruptible industrial customers. These normally require about 516,000 M.c.f. daily. Some customers which had not been cut off since 1952 this time had to switch to standby fuel oil.

Even the record withdrawals didn't tax the underground facilities to their limit. The two companies estimate they can sustain a delivery rate of 2.25 billion cubic feet for about 3 days. There is little likelihood of that ever happening. It would require an average temperature of 38°.

The Playa del Rey withdrawal capacity was recently doubled from 10 to 20 million cubic feet an hour. Ultimately, it will have a discharge rate of 27 million cubic feet an hour.

Still another huge underground storage unit now is being readied at Montebello in east Los Angeles. This unit, when ready to go in 1958, will have an operating capacity of 12½ billion cubic feet, ranking it with the nation's largest. About one-fourth of the 26 billion cubic feet of cushion gas required at the Montebello plant has been injected.



Vital Line Started

Union links San Joaquin to its Oleum plant near Frisco

BAKERSFIELD.—Union Oil Co. has started work on what will be California's longest crude line.

The 225-mile carrier will move San Joaquin crude north to the company's Oleum refinery at San Francisco. It also will carry cracking stocks and distillate from Union's 20,000-bbl. delayed coker near Santa Maria.

Designed for a throughput of 75,000 bbl. daily, the line will be 12-in. in diameter from the existing Junction station to a new station being built at Coalinga (see map). The line will be 16-in. from there on in to the refinery.

In addition to the new Coalinga station, a second booster is being built near Patterson. Intermediate stations are planned for Panoche and Byron at some time in the future. These will raise the capacity to 100,000 bbl. daily.

Connecting lines . . . Two existing 8-in. crude lines from the valley to the coast will be tied in with the long carrier. One will continue to move valley crude to the Santa Maria refinery, via an 8-in. line from Avila to the plant.

Flow through the second line will be reversed to bring unfinished products from the plant to the Junction station. The new system will take them on to Oleum.

The company now transports San Joaquin Valley crude from Avila to either Los Angeles or Oleum by tanker. The new line will release one tanker from these runs.

Roy Price, Inc., contractor, has four spreads at work. Good weather will permit initial operation of the line by May 1. Full operation is scheduled in August.

Processing briefs

A di-isobutylene unit with a capacity of 8,000,000 lb. a year will go on stream this week at The Texas Co.'s 230,000-bbl. Port Arthur, Tex., refinery.

Di-isobutylene is used in plastics, elastomers, lubricating-oil additives, and other chemical products. It is manufactured by polymerizing isobutylene, a product of thermal and catalytic cracking of petroleum fractions.

Imperial Oil, Ltd., plans to spend $17 million doubling capacity of its 9,200-bbl. Calgary refinery if it can rezone a 260-acre tract next to the existing plant. The project includes catalytic processing facilities. Calgary now operates thermal cracking and alkylation units.

The number of grades of paving asphalts has been lowered from nine to five by the Asphalt Institute. This move followed a series of discussions with asphalt users, highway officials, and refinery representatives. Four of the grades are basic paving grades, listed as 60-70, 85-100, 120-150, and 200-300 penetration. The fifth grade of penetration is designed for special and industrial uses.

Skelly Oil Co., Tulsa, will build a 3,000-4,000 bbl. air-cooled HF alkylation unit at its El Dorado, Kans., refinery. The new unit will use the Perco HF alkylation process under license from Phillips Petroleum Co. Skelly personnel will handle the engineering and construction. It is slated for completion in 1958.

U. S. Oil & Refining Co. is adding a 2,500-bbl. per day Houdriformer to its new Tacoma, Wash., refinery. The plant is due to go on stream this summer. Holmes & Narver of Los Angeles is building the cat reformer from process design by Houdry Process Corp. The three-chamber unit will use Houdry 3-D platinum catalyst in processing virgin naphtha and thermal gasoline feeds from Canadian and Middle East crudes.

Esso Research & Engineering Co. has acquired a license to use Dow Chemical Co.'s Type B catalyst, and Dow's process for making butadiene. Catalyst and process will be made available to all affiliated companies in the Standard Oil Co. (N. J.) group.

First use will be in a new butadiene plant which Esso Petroleum, Ltd., plans to complete at Fawley, England, in 1958. The process and the calcium nickel phosphate catalyst were jointly developed by Dow and Polymer Corp., Canada's government-owned synthetic-rubber facility, located in Sarnia. Commercial development was undertaken at Sarnia.

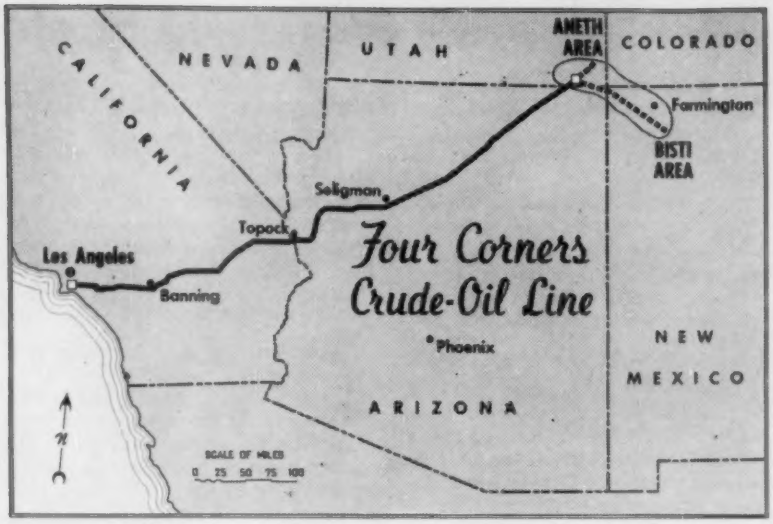
Shell Oil Co. of Canada, Ltd., will build a 600-ton asphalt plant at its Montreal East refinery. Feed stock for the new $1,000,000 plant will be supplied from existing distillation units at the refinery. Completion is slated by June.

Tidewater Oil Co. is beefing up its marketing position in the Greater New York area by purchase of Walker Oil Products, Inc., of Yonkers. It means a gain of 150 retail accounts, a water terminal, a bulk plant, office building, and warehouse in Westchester, Bronx, and New York counties.

Also for Refiners . . .

Refiners have started cutting back crude runs and altering yields to produce more fuel oil, less gasoline. It's part of industry's answer to Washington's plea for more oil for Europe (P. 64) . . . Strike threat looms for Sinclair refineries. O.C.A.W. threatens strike vote unless company starts negotiations on nation-wide contract (P. 68) . . . The chemical industry is charting a $2½-billion construction program for the next 2 years. (P. 68) . . . Science can pack a popular appeal, M.I.T. found at its Tulsa conference last week. (P. 70) . . . Plans have been firmed up to link Los Angeles refining area with Four Corners oil area by 600-mile line. (P. 74) . . . Israel is plugging for big-inch line to bypass Suez Canal. It would serve Haifa refinery as well as make crude available at Mediterranean port for export. (P. 86.)

PLUS THESE TECHNICAL FEATURES: Tips for gas plants: Ten things Humble learned about lubrication during extensive study (P. 102) . . . How one company purifies its boiler water to prevent silica deposition on turbine blades and boiler tubes (P. 106) . . . The Foreman's Page (P. 129) . . . Equipment Design and Operation (P. 130) . . . and Questions on Technology: A three-page report on how refinery size affects profits (P. 133).



Four Corners Line Jells

- Shell-Standard of California combine plans to complete crude line to Los Angeles late this year
- But Texas-New Mexico insists plan for line from Four Corners to the southeast remains unchanged

HOUSTON.—Plans for a major crude-oil pipeline between the Four Corners area and Los Angeles were firmed up last week.

Four-Corners Pipe Line Co., which will build the 600-mile line, was formed by Shell Oil Co., Standard Oil Co. of California, Gulf Oil Corp., Continental Pipe Line Co., Richfield Oil Corp., and Superior Oil Co.

The new company revealed that plans now call for a larger line than had been contemplated earlier. The trunkline will be 16 in. in diameter and will have an initial capacity of 60,000 bbl. daily. Earlier reports indicated it would be a 14-in. line with 50,000-bbl. daily capacity *(The Oil and Gas Journal, January 28, page 125).*

Original plans for the line were announced by Shell and Standard of California last fall *(The Oil and Gas Journal, October 22, 1956, page 74).*

Rush-up plans for the crude system apparently put the Shell-Standard of California group well ahead of other companies which had been hoping to get first chance at new production in the Four Corners area. Work will start on the westbound system "with initial delivery of pipe in April of this year," the new firm announced.

Shell Pipe Line Corp., which will construct and operate the line as agent for Four-Corners Pipe Line, has completed much of the preliminary engineering work.

Competitor's plans unchanged . . . Texas-New Mexico Pipe Line Co., recently announced plans for a line moving Four Corners crude southeast to Jal, N. M.

From there the crude would be relayed into existing lines serving Gulf Coast and Mid-Continent refineries *(The Oil and Gas Journal, December 24, 1956, page 35).* Owners of Texas-New Mexico Pipe Line include The Texas Co., Sinclair Pipe Line Co., Tidewater Oil Co., and Empire Gas & Fuel Co. (Cities Service Co.).

There have been reports that Texas-New Mexico had been stymied by failure to obtain the necessary steel. But a Texaco spokesman said last week that plans for the southeastward line are unchanged. He said surveys have begun along this route. Completion, he said, will depend on steel deliveries and other factors.

Quick work on the westward line also dims the chances of Northwest Pipeline Corp. to obtain Four Corners crude for transport to Salt Lake City This firm, a subsidiary of Pacific Northwest Pipeline Corp., has announced plans for a line to move 15,000 to 25,000 bbl. per day of crude and products to Salt Lake City refineries.

Four-Corners Pipe Line has estimated cost of its proposed system at $50,000,000. Initial capacity of 60,000 bbl. per day could be boosted to 160,000 bbl. daily by increasing the number of pump stations.

The new company said it is expected that crude shipments out of the bustling Four Corners area can be started by the end of this year.

Line details . . . The 16-in. main line will start on the Navajo Indian Reservation in the southeast corner of Utah and extend to Los Angeles refineries.

In addition to the 600-mile trunk line the system will include about 150 miles of 8-12-in. feeder lines. It will serve Aneth and other fields in Utah and Bisti field in New Mexico. These two fields now produce only about 4,400 bbl. of oil per day. But their development has been slowed by lack of pipelines.

President of Four-Corners Pipe Line is R. G. McIntyre. He retired January 31 as chairman of the board of Standard Oil Co. of Texas and as president of Pasotex Pipe Line Co. Main offices of Four-Corners will be in Houston.

Owners of the company include some of the West Coast's major refiners.

Shell and Standard of California each has a 25 per cent interest in the new firm. Gulf owns 20 per cent, and Continental, Richfield, and Shell each has 10 per cent.

"Westward movement of Four Corners oil is both logical and essential because of California's ever-increasing requirements for crude and the proximity of Los Angeles refineries, which are 400 miles closer to the Four Corners area than are the major U. S. Gulf Coast refineries," said McIntyre.

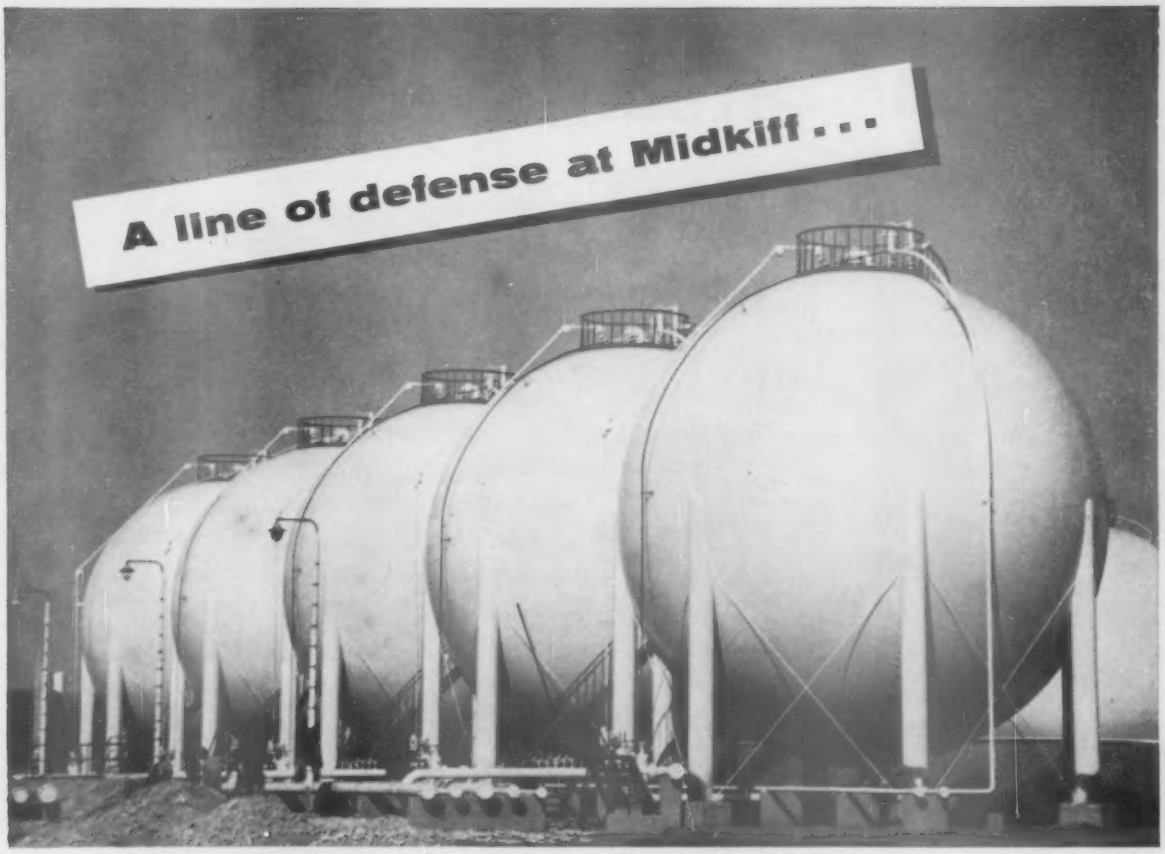
"We feel that this line will provide a real service by establishing another source of crude oil for the Pacific Coast's expanding economy, while stimulating development of what promises to be a major producing area."

Cold Aids Canadian Drillers

CALGARY.—Cold weather is proving a boon to operators in northern Alberta by holding the muskeg solid, thus permitting more drilling rigs to work in the area than ever before.

At present 72 rigs are working in the Peace River region, 28 of them on the British Columbia side and the rest in Alberta. Altogether 251 outfits are active in western Canada.

Sparking this activity is a drive to find gas supplies for the Westcoast Transmission line now being built.



Five Hortonspheres used for the storage of Butane

If *you* store or handle butane, you must take measures to prevent it from disappearing into the atmosphere. The 5,000-bbl. Hortonspheres® shown above, designed for 100 lbs. per sq. in. working pressure, are a reliable line of defense at the El Paso Natural Gas Company's Midkiff plant near Rankin, Texas. Vapor cannot escape as long as the internal pressure does not exceed the settings of the pressure relief valves.

Hortonspheres are built in capacities to 30,000 bbls. and for pressure to 217 lbs. per sq. in. in the smaller sizes. Write our nearest office for further information.

CBI

Chicago Bridge & Iron Company

Atlanta • Birmingham • Boston • Chicago • Cleveland • Detroit • Houston
Los Angeles • New York • Philadelphia • Pittsburgh • Salt Lake City
San Francisco • Seattle • Tulsa
Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY and GREENVILLE, PA.

Now — You *Fly* Through

More POWER
More SPEED
More COMFORT
More BEAUTY
More SAFETY

Here is the twin-engine airplane that provides *everything* — from the most visibility to easier entrance and exit. Like ultra-modern airliners, the new Twin-Bonanza has low-wing design safety — and passengers are far behind whirling propellers.

Supercharged engines provide *speed to spare.* And there's no ducking, stooping or stretching when entering or leaving the Twin-Bonanza.

The quiet, luxurious comfort of this outstanding airplane can only be fully appreciated in a demonstration ride. Contact your Beechcraft distributor or dealer who represents the world's finest aviation service organization — he will be happy to oblige.

The BEECHCRAFT Twin-Bonanza
Flying 6 persons as far as 1,650 miles
at speeds up to 240 miles-per-hour.

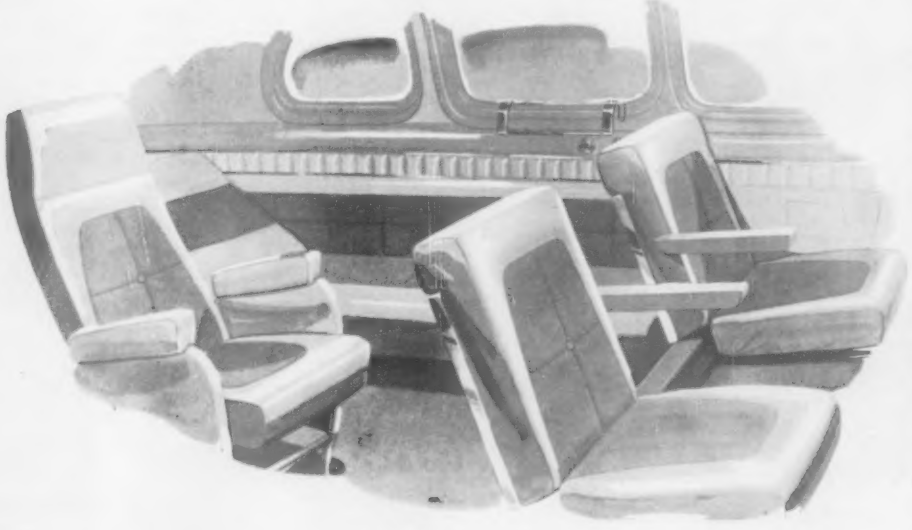
the Air at 240 Miles Per Hour!

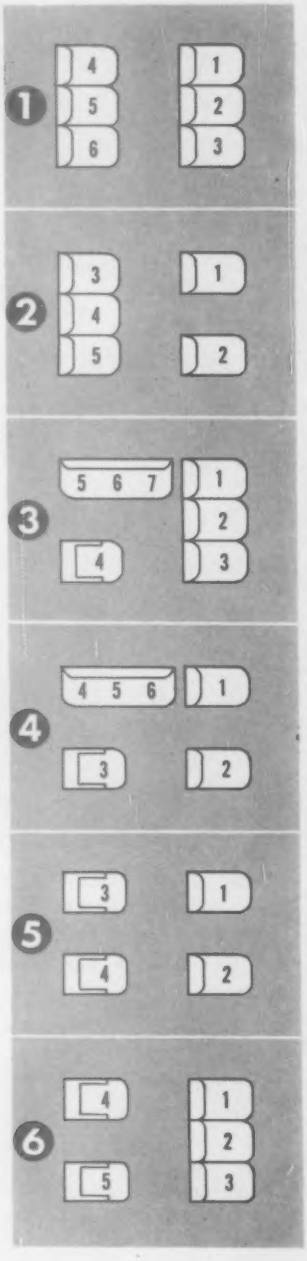
IN THE *New*, BIG, BEAUTIFUL BEECHCRAFT TWIN-BONANZA

New speed, new power, new luxury — and *six* different interior seating arrangements — are yours in the brilliant *new* Beechcraft Twin-Bonanza for 1957!

Here's the luxury and comfort of your own living room — styled to the ultimate in taste and decor — with unequalled stretch-out room for every passenger!

Note the six illustrated seating arrangements on the right — then see your Beechcraft distributor or dealer for the *finest* planes in the skies, and the most *comfortable* finance plans in aviation!

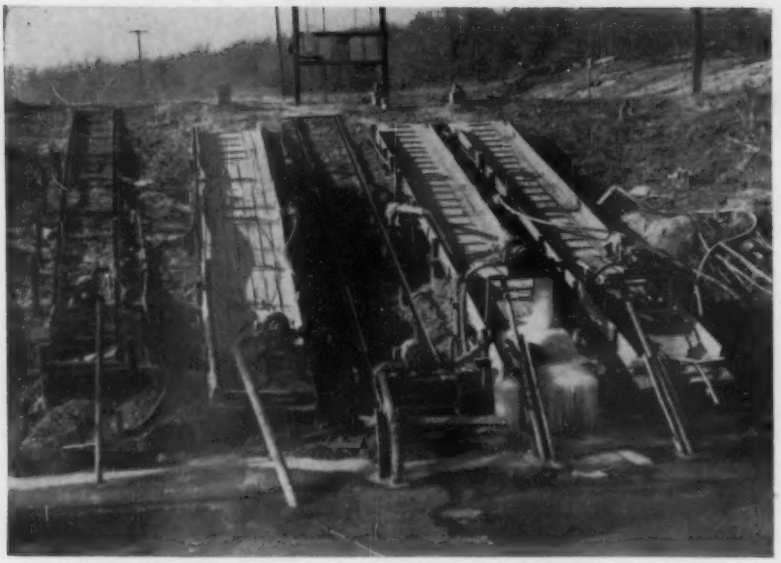




Beechcraft

BEECH AIRCRAFT CORPORATION
WICHITA, KANSAS, U. S. A.

BEECHCRAFTS ARE THE AIR FLEET OF AMERICAN BUSINESS



Pumps that slide with the tide and a . . .

Man-made lake for emergency storage combine as . . .

Water Flood Gears For Drouth

TULSA.—A small water flood in the north extension of Glenn Pool, about 10 miles south of here, depends on Polecat Creek. And the creek is not dependable.

It holds plenty of water during the winter, but when summer comes it frequently "runs dry." So the operator, Fair Glenn Oil Co. of Tyler, Tex., built a lake which holds about 3,000,000 bbl.—enough to last 3 months and carry the project through the "lean" period.

Fair Glenn also kept the varying water level in mind when it installed the five pumps which keep water from Polecat Creek flowing into the lake. The pumps were rigged to a pulley system that slides them up or down the creek bank so they will always be just above the water line.

The company holds some 1,300 acres in the field and has 700 acres under flood. The project, started 3 years ago, now has 32 injection wells injecting 14,000 bbl. of water daily. Plans call for 50 wells injecting 32,000 bbl. daily at the height of the program.

The area under flood contained 115 old wells which produced from 1907 to 1925 when they were plugged. Revival of the field through the flood has brought production back up to more than 700 bbl. daily from 28 producing wells. The company will add at least seven more wells and expects to add 12 years to the life of the field. Pay zone is the Bartlesville at 1,500 ft.

Other operators in the field, including Gulf Oil Corp., have water-flooding programs under way. Plans are in the mill to bring the entire north extension under flood.

Fair Glenn estimates reserves recoverable by water flood at about 15,000 bbl. per acre. Total reserves are estimated at 35,000 to 50,000 bbl. per acre. The company is toying with the idea of using thermal-recovery methods to get the rest of the oil out of the ground.

Humble Adjusts Its Prices

HOUSTON.—Humble Oil & Refining Co., which started a general crude-oil price increase early in January, has cut back its posted prices 5 cents per barrel at many fields along the Texas coast.

The price reductions went into effect February 1. They affected more than 50 fields where Humble had posted increases averaging about 40 cents per barrel January 3.

Several major purchasers had reduced prices in some inland areas after adopting higher postings last month. But until Humble's new prices went into effect, the higher postings had been generally firm for fields near tidewater.

Along with the reductions, Humble increased its posted price 10 cents per barrel for crude purchased in Goose Creek field, Upper Gulf Coast. The company described the new postings as "minor adjustments."

Royalty Limit Bill Killed

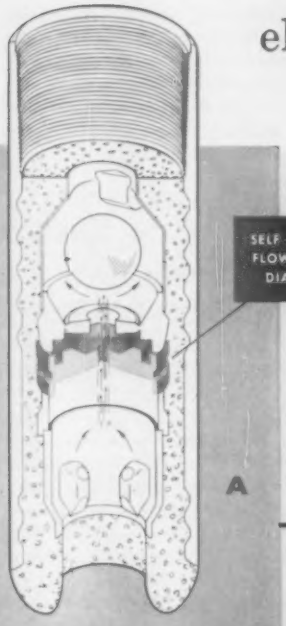
HELENA, Mont.—The Montana Senate has killed a House-approved bill that would have removed the 12½ per cent limit on royalties from the first 3,000 bbl. of oil produced monthly on state-owned lands.

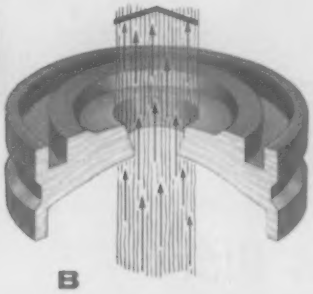
However, the 12½ per cent royalty still is under attack in the State Supreme Court. The tribunal is studying a case filed by Hardie N. Strandberg against the Montana Land Board seeking to prevent the agency from validating leases on four Fallon County tracts which were advertised for sale last year at 16⅔ per cent royalty.

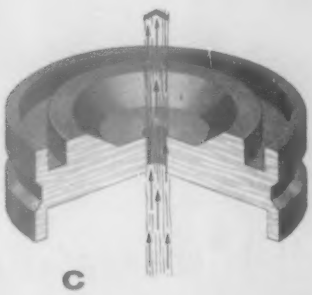
Atty. Gen. Forrest H. Anderson claims the 1951 law setting the 12½ per cent royalty is unconstitutional. He says it violates the federal enabling act, which requires the State Land Board to obtain full market value for its leases.

See for yourself...

how the variable valve in FLEXIFLOW Shoes and Collars automatically fills the casing and eliminates destructive pressure surges



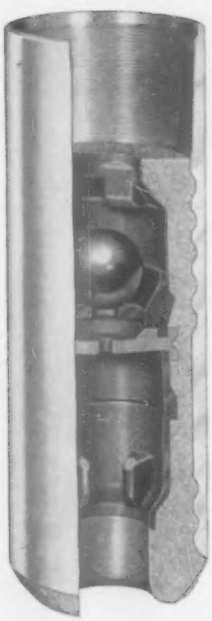




A—The VARIABLE VALVE consists of a small hole in the center of a reinforced synthetic rubber disc called "Flow Control Diaphragm"; see view at left

B—As the casing is lowered, pressure from below is exerted on the diaphragm and causes the hole to open up (see B) and a sufficient volume of fluid enters the casing to prevent a build-up of destructive pressure surges

C—As the rate of lowering the casing is lessened (just prior to setting the joint in the slips) differential pressure from below decreases and permits the Flow Control Diaphragm to contract, thus causing the hole to return to its smallest diameter (C). The reduced volume of fluid entering the casing prevents overfill.



Baker
FLEXIFLOW FILL-UP Shoe
Product No. 160

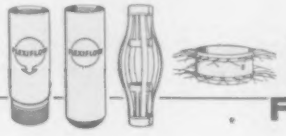
When casing equipped with FLEXIFLOW Shoes or Collars is lowered in the well, increase in pressure from below causes the variable valve to open up wider to relieve pressure from below by permitting a large volume of fluid to enter the casing. When downward movement of the casing is slowed down, pressure from below is reduced and the hole in the diaphragm contracts to restrict the fluid entry and prevent overfilling. This action of the variable valve in opening wider and closing down, synchronizes the rate of fill of the casing with the rate of lowering the casing, *and in so doing provides maximum relief from pressure surges.*

CUTS RUNNING TIME ONE-THIRD — Baker FLEXIFLOW Shoes and Collars can safely reduce casing running time by as much as one-third, because . . . they completely eliminate time-wasting surface filling of casing; and they permit the casing to be run faster due to the automatic "fill" from the bottom that eliminates possible damage to the formation from high-pressure surges.

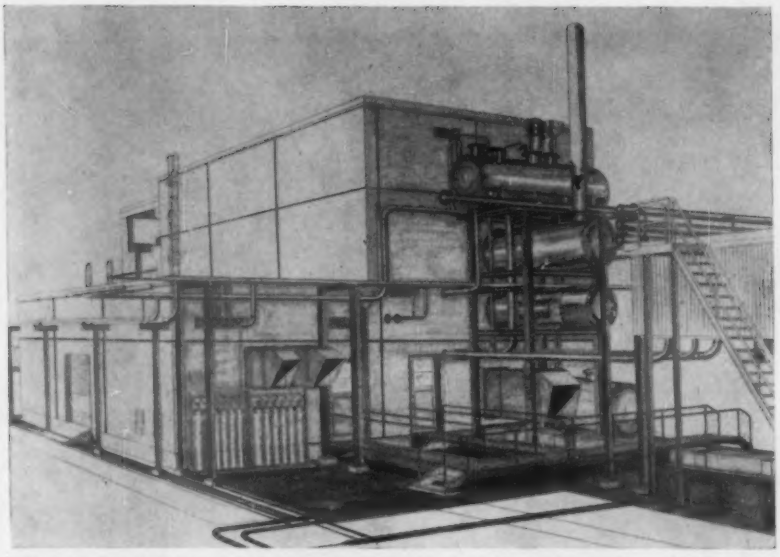
BAKER OIL TOOLS, INC., HOUSTON • LOS ANGELES • NEW YORK

There's a Baker representative near you ready to explain the application of FLEXIFLOW Shoes and Collars and the part they play in Baker "Protective" Cementing.

For better Primary Cementing
Baker Flexiflow Fill-Up Collars and Shoes
Baker Casing Centralizers
Baker Wall Scratchers



BAKER FLEXIFLOW



SATELLITE STATION developed by Gulf Interstate Gas Co. is designed especially for new engine-driven centrifugal compressors. Concrete wall separates engine from control room. Compressor (in rear) is outside so any leakage will be to open air.

Gulf Interstate Maps Plans To Boost Capacity to Limit

HOUSTON.—The biggest installation of engine-driven centrifugal compressors in the industry is planned this year by Gulf Interstate Gas Co.

The centrifugals will provide 49,000 hp. of the total 69,000-hp. program laid before the Federal Power Commission last week. This expansion will bring the system to its design capacity of 575,000,000 cu. ft. daily. It is to be completed by November 1.

Cost of the facilities will be $24,500,000. This is in addition to $10,000,000 in station work now being finished, raising capacity to 448,000,000 cu. ft. daily.

The original system, which started operations in 1954, had a capacity of 375,000,000 cu. ft. daily with 40,000 hp. After the new program is completed, compressor units will total 140,000 hp. The next logical step in expansion will be to add loops along the 845-mile, 30-in. main line which moves gas from Louisiana to Leach, Ky., for Columbia Gas Systems, Inc.

New station designed . . . To make remote control entirely practicable, Gulf Interstate has designed a special type of engine-driven centrifugal station (see drawing). Safety was a prime design factor.

The building has no windows. A 12-in. concrete wall separates the engine from the control room. The centrifugal compressor is outside the building. Any leakage would be to the open air.

"This is a station you can walk away from if trouble occurs," Farile S. Young, vice president of Gulf Interstate, says. "All the engine can do is to run down and stop."

Station program . . . Each of Gulf Interstate's 10 compressor stations will have 14,000 hp. when construction is completed.

All engine-driven centrifugals will be powered by Cooper-Bessemer LSV-16, 3,500-hp. units like the original installations of this kind. Three of the reciprocating stations will have Cooper-Bessemer GMWA8 units. The other two reciprocating stations will be powered by Clark TLA6 units. All are 2,000 hp.

The centrifugal stations are entirely automatic and remote controlled. The others are semiautomatic.

There are now five centrifugal stations at intermediate points between the original five reciprocating stations. Individual stations will continue to have only one type of compressor. The centrifugal stations are controlled from Nashville, Tenn.

Pioneering efforts . . . Gulf Interstate's program points up its leadership in two fields—the acceptance of this new type of drive for gas lines, and remote station operation. The firm pioneered use of the engine drive for centrifugal compressors. The first one was placed in operation in January 1956. It is a prototype of satellite compressor stations.

Gulf Interstate was so pleased with results of the first unit that five others were installed last year, making a total of six engine-driven centrifugal units at five stations. The trend in this direction is emphasized by the fact that Westcoast Transmission Co., Ltd., this year will become the first pipeline to include such units in its original design.

Old Tax Issue Back

Texas may try again to tax pipelines on gas reserves

AUSTIN.—Gas trunk lines may again this year have to battle the Texas tax that won't stay dead.

This is the well-worn proposal for taxing gas reserves tied up under long-term contracts. It has never been passed, but it gets a good dusting off during every session of the legislature.

This year, Texas isn't sure yet that it needs new revenue sources. If it does, however, Gov. Price Daniel says he will recommend the "dedication" tax. The companies paying it would be the "beneficial" owners—in simpler terms, the pipelines.

The provisions . . . Daniel has gone so far as to set out the main provisions of the bill. It would fix the tax at 0.75 cent per M.c.f.

"These dedication contracts," Daniel said in his budget message, "are tying up gas reserves in Texas in many instances for as long as 20 or more years.

"At least half the reserves are being committed to out-of-state users. Such contracts and the privilege of withdrawal thereunder are valuable rights and properly taxable by the state."

Daniel estimated state income from such a tax at more than $35,000,000 for the next 2 fiscal years.

Gray Succeeding Flemming

WASHINGTON.—Arthur S. Flemming resigned as mobilization director last week.

President Eisenhower immediately announced he would be succeeded by Gordon Gray, now an assistant secretary of defense.

Flemming's return to his post as president of Ohio Wesleyan University winds up long service to the Government which has kept him in Washing-

ton almost continuously since 1939. He served under three presidents. He had been with ODM since 1951, being named director in 1953.

Gray, a 47-year-old North Carolina Democrat, first entered government service in 1949 when President Truman named him an assistant secretary of army. In 1949 Truman elevated him to secretary of army. Following Eisenhower's election, Gray was named president of the University of North Carolina where he stayed until 1955 when he was picked as assistant secretary of defense in charge of international affairs.

Alaska Gets Refinery

7,500-bbl. plant and lines set for completion by 1959

HAINES, Alaska.—Preliminary work is under way on a proposed $15-million refining-and-distribution project for Alaska and Yukon.

Alaska-Yukon Refiners & Distributors, Ltd., Edmonton, plan to complete a 7,500-bbl. refinery at Haines in 1958. This will include a 2,500-bbl. thermal cracking unit. The refinery cost is estimated at $6 million.

Products from the refinery would be carried through:

. . . A proposed line to Haines Junction about 150 miles northwest of Haines. The new line would connect with the government-owned Canol products line, built during World War II. Construction is scheduled to start this spring. It would cost $3,500,000.

The war-built Canol line extends from Skagway, Alaska, to Whitehorse, Yukon, and northwesterly to Fairbanks in central Alaska.

. . . A proposed line to Anchorage from Tok Junction. The new line would connect with the Canol line at Tok Junction, about 190 miles southeast of Fairbanks.

This new line would cost $5,000,000 and would be completed in 1959.

The refinery at Haines—which is a year-round deep-water port—would receive its crude supply by tanker from the western terminus of Trans Mountain oil pipeline.

Key to the project depends on whether the government Canol line will be made a common carrier.

Marketing of the products would be handled by Royalite Oil Co., Calgary, which recently announced plans for a $50,000,000 development program for the Athabasca sands.

Alaska-Yukon is headed by Joseph T. Sparling, construction superintendent of the Canol line, and later president of Sparling-Davis Co., Ltd., specialists in oil-field construction.

Pipeline briefs

Continental Pipe Line Co. has purchased a 99-mile crude pipeline across North Texas and is converting it to products service. The 6-in. line, formerly owned by Gulf Oil Corp., extends from the Wichita Falls area to Saginaw, a suburb of Fort Worth.

W. L. Kygar, president of Continental Pipe Line, announced plans to extend the line to the Grapevine area about 15 miles northeast of Fort Worth. Continental Oil Co. has started moving gasoline through the line from its Wichita Falls refinery to a temporary terminal at Saginaw. Conoco will build a $320,000 products terminal near Grapevine.

Mene Grande Oil Co. will build a 58.6-mile, 30-in. crude pipeline from fields in Eastern Venezuela to Puerto La Cruz. It is to be started this year and completed the first quarter of 1958. The route will parallel the Puerto La Cruz highway.

Natural Gas Pipeline Co. of America has cleared the last obstacle to building its 350-mile, 20 and 26-in. line from Fritch in the Texas Pandle through southwestern Oklahoma to Wise County, Texas. The Federal Power Commission has denied applications for a rehearing asked by Lone Star Gas Co., Oklahoma Natural Gas Co., and Consolidated Gas Utilities Co. Lone Star was authorized to sell Natural up to 100,000,000 cu. ft. daily in southern Oklahoma. Deadline for accepting the certificate to make the sale was extended until March 8.

Transcontinental Gas Pipe Line Corp. plans to build 28.5 miles of 16-in. to take gas from Block 45 field, 7½ miles off the coast of Cameron Parish, Louisiana. The line and related facilities costing $2,436,000 were tentatively approved by the FPC. Transco said the line would make available 88 billion cubic feet of reserves in Block 45 and still more gas nearby. First year's delivery will be 30,663,000 cu. ft. daily, but the line capacity of 110,000,000 cu. ft. is to be used fully in 2 or 3 years.

Interprovincial Pipe Line Co. transported 96,700,000 bbl. of crude during 1956, 16,200,000 bbl. above the previous year. The increasing demand for Western Canada crude—and looping programs just completed and planned—assure another sharp throughput increase for this year.

Interprovincial has already contracted 112 miles of 24-in. and 26-in. loops in Saskatchewan and Manitoba and on the U. S. part of the system this year. This will cost $8 million. The 157-mile extension from Sarnia, Ont., to the Toronto area is to be let within a week. This 20-in. extension opening a new market for Canadian crude will be started this spring and completed before the end of the year.

Fairfax Pipe Line Co., a products system headquartered in Houston, has been renamed American Oil Pipe Line Co. The firm is a subsidiary of American Oil Co. American crude lines have merged with the affiliated Service Pipe Line Co. under a consolidation plan of the parent Standard Oil Co. (Ind.).

United Gas Corp. has budgeted $50 million for its 1957 construction program. This is some 30 per cent higher than last year's outlay, which amounted to more than $38 million.

Also for Pipeliners . . .

Bottleneck of Texas pipelines is still considered by many to be one of major factors in holding up increased oil flow to Europe. Answer may lie in use of uneconomic transportation (P. 62) . . . El Paso completes acquisition of Pacific Northwest (P. 64) . . . Trans-Canada has finally cleared up its financing (P. 72) . . . Underground storage pays off for California gas companies (P. 72) . . . Union is linking San Joaquin crude with Frisco refinery (P. 73) . . . Plans have been completed for crude line from Four Corners to Los Angeles; Texas-New Mexico insists line also will be laid southeast (P. 74) . . . Gulf Interstate plans big expansion with engine-driven centrifugal compressors (P. 80) . . . Texas gas lines again face battle to beat down proposed tax on reserves (P. 80) . . . Pipeline system planned to move products from refinery proposed at Haines, Alaska (P. 81) . . . Gulf has tough time completing 41-mile line in Sicily (P. 85) . . . Israel plugging for big-inch crude line that would bypass Suez (P. 86) . . . World's longest aluminum line is planned in Colombia (P. 88).

PLUS THESE TECHNICAL FEATURES: A detailed report on the more than 31,000 miles of crude and products pipelines laid from 1933 to 1955. Lines are broken down by state, size, and companies (P. 116) . . . and Pipeline Patrol outlines a procedure for handling all right-of-way problems. Special cases are included (P. 139).

New Socal Tool Logs Porosity

LOS ANGELES. — A new well-logging tool which logs the porosity of potential oil-producing formations will be available to the industry soon.

Actually the instrument records the density of formations exposed in the well bore. But from this information porosity of the formations can be calculated.

Developed in the La Habra laboratories of California Research Corp., a Standard Oil Co. of California subsidiary, the device is formally called the "Density Logger." The researchers, however, dubbed it the "Seventh Sense."

How it works . . . Lowered into a well, the instrument measures gamma-ray reflections as they bounce off walls of the hole. The proportion of gamma rays which reflect back to a radioactivity detector varies according to the density of the surrounding formations.

Having knowledge of the potential pay's porosity, the operator will be in a better position to decide whether to abandon or continue a wildcat.

The instrument first was tested on concrete blocks of known density at the La Habra labs. Further tests with both thick and thin-wall blocks indicated the gamma rays penetrate deep into surrounding formations. Density data recorded thus are representative of formation rocks some distance from the well bore.

Following the lab work, McCullough Tool Co., Los Angeles, built and tested a field model of the "Seventh Sense" in California, Texas, and Canada. The company within the next few months will offer the new logging service on an industry-wide basis.

Deep Search Hits Again

JACKSON, Miss.—Deep exploration along southern Mississippi's Lower Cretaceous trend has scored again—the second time this year.

Central Oil Co. last week opened a Bailey-sand oil field 28 miles southeast of here in northeastern Simpson County. The discovery well, 1 Jennings, is 10 miles west of California Co.'s Bailey-sand find completed less than 2 weeks before in southwestern Smith County.

Central's well was rated good for 194 bbl. of 44°-gravity oil daily while flowing through a 9/64-in. choke. Flow was under pressure of 1,550 psi. Its Bailey zone (lower Trinity-Sligo) is perforated at 12,396-12,407 ft.

Location is 6 miles northeast of Mendenhall.

Harbor Leases Hit

Los Angeles ponders new policy on city-owned lands

LOS ANGELES. — Plans for a uniform policy in granting oil leases on city-owned properties were being studied last week by the Los Angeles City Council.

Leases granted heretofore largely have been on a negotiated basis, rather than competitive bidding. This policy drew heavy fire last month when two Los Angeles Harbor leases were let by the Harbor Department. Critics claimed the city would have received a higher royalty had competitive bidding procedures been followed.

An immediate result was that the Recreation and Parks Commission delayed plans for leasing the 160-acre Rancho Park Golf Course. This tract is adjacent to the Beverly field where Universal Consolidated Oil Co. is developing deeper pays by slant drilling from a 20th Century-Fox movie lot. Bids were to have been opened January 31. They are now scheduled to be opened on February 28.

Signing of the 1,350-acre lease in the Los Angeles inner harbor likewise was held up. The Harbor Department had recommended it be let to Standard Oil Co. of California, G. E. Kadane, Noah Dietrich, and others. Several major companies which had been preparing to submit leasing offers protested the action.

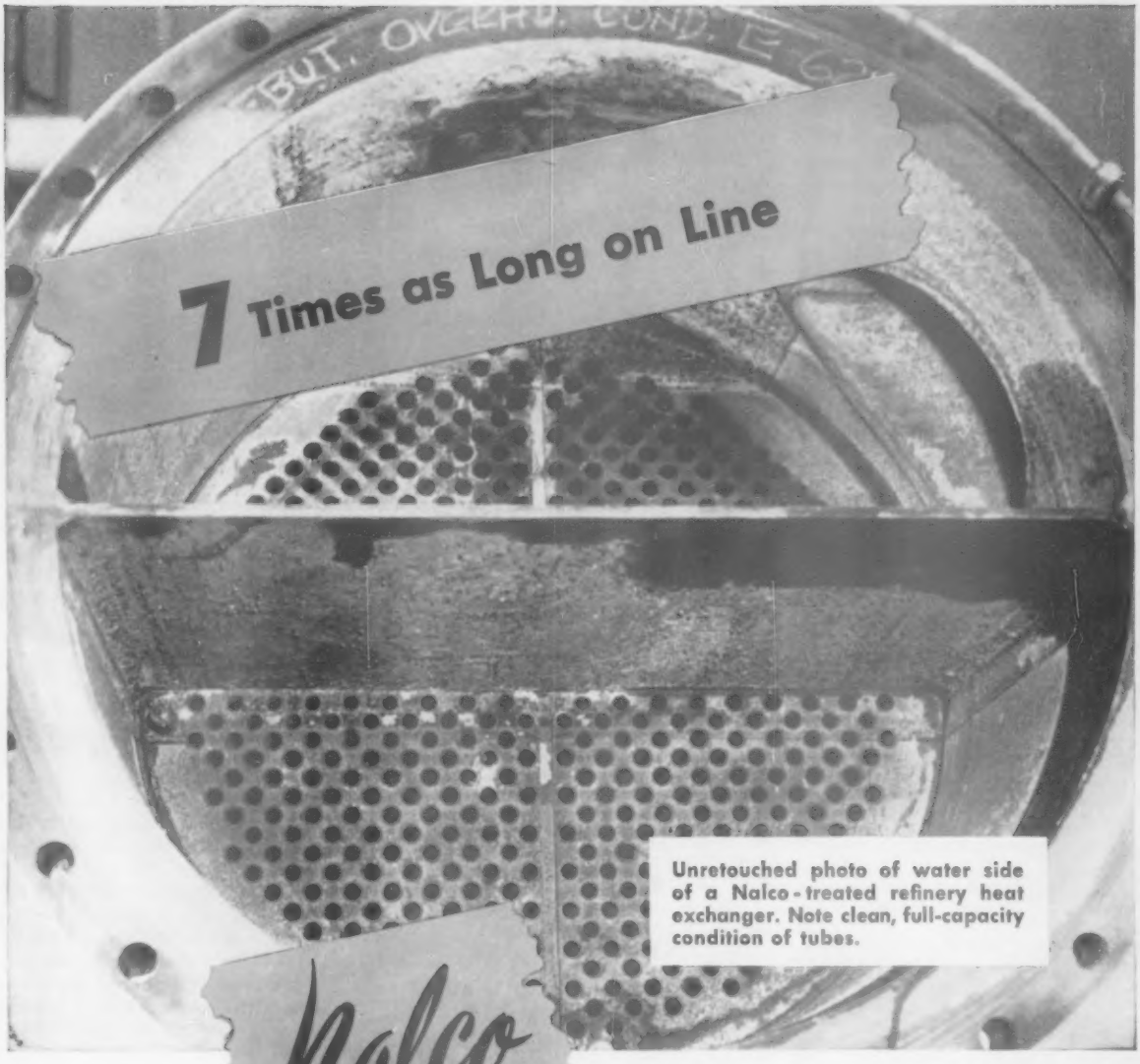
They likewise protested the negotiated lease let to Los Angeles Harbor Oil Development Co. last December 27. This lease covered submerged lands outside the breakwater. Officials of this company include Noah Dietrich, president, and J. R. Pemberton, vice president.

Big Flood Near Approval

LONG BEACH.—Plans for a 180,000-bbl. daily water flood in the Long Beach Harbor area of the Wilmington field need only one more approval before work can be started.

Approved by both the Long Beach Harbor Department and the city council, they now need only that of the State Lands Commission. The commission is expected to consider the proposal at its March meeting.

The huge flood—probably the forerunner of even greater projects there—will be carried out by contract operator, Long Beach Oil Development Co. The project is designed to increase oil recoveries as well as check land subsidence. Ocean water obtained from shallow wells will be used.


7 Times as Long on Line
Unretouched photo of water side of a Nalco-treated refinery heat exchanger. Note clean, full-capacity condition of tubes.

SINCE Nalco TREATMENT TOOK OVER

This refinery heat exchanger was a prize example of plugging and corrosion headaches before Nalco System treatment was applied to the cooling water. After *7 times as long* as average previous runs, the exchanger was opened for inspection and found clean and corrosion free.

Consider your system. How much would you save by drastically cutting . . . perhaps even eliminating . . . the number of manual or mechanical cleanings of heat exchangers? Certainly it is substantial . . . more than enough to warrant writing or calling, TODAY, for more information from Nalco.

NATIONAL ALUMINATE CORPORATION
Telephone POrtsmouth 7-7240
6242 W. 66th Place • Chicago 38, Illinois
In Canada: Alchem Limited, Burlington, Ontario

THE Nalco® SYSTEM . . . Serving Industry through Practical Applied Science

Imports drop only a little, but . . .

. . . Exports Tell the Suez Story

EXPORTS reflected the closing of the Suez Canal and Iraq Petroleum Co.'s pipelines more than imports for the month of November.

Total exports more than doubled from October to November but imports decreased only 13.6 per cent, according to the Census Bureau of the Department of Commerce.

Several factors influenced the small decrease in imports. November was the first month affected by the closing of the canal and pipelines. Some tankers that had passed through the canal did not discharge cargo in this country until later in November. Other tankers were either loaded at Middle East ports or chartered for movement from Middle East to East Coast of U. S.

The November figures also show that there was some gain in imports of Venezuelan crude to replace normal shipments from the Middle East.

And last, imports of residual fuel generally increase during the winter months, so the small decrease reported for November represented more of a cutback than the figures show.

IMPORTS INTO CONTINENTAL UNITED STATES

(Thousands of barrels)

	Nov. 1956	Oct. 1956	Nov. 1955
Crude—			
Mexico	508	880	270
Colombia	900	875	827
Venezuela	15,430	14,781	12,358
Ecuador			72
Trinidad		233	
Kuwait	2,627	4,682	4,651
Saudi Arabia	984	2,493	2,904
Neutral Zone	396	493	444
Iraq	348	1,335	460
Iran		988	571
Qatar	411	158	465
Canada	4,137	4,479	2,399
Far East	1,770	1,501	1,078
Total crude	27,511	32,898	26,499
Daily average	917	1,061	883
Products—			
Residual fuel	13,314	14,564	13,264
Other products	1,503	2,391	1,937
Total products	14,817	16,955	15,201
Daily average	494	547	507
Total all oils	42,328	49,853	41,700
Daily average	1,411	1,608	1,390

EXPORTS*

Crude	8,332	1,444	872
Gasoline	2,570	2,258	2,050
Kerosine	562	330	93
Distillate	5,073	2,596	1,427
Residual	2,283	1,298	1,489
Lubes	899	1,072	1,030
Other products	1,098	1,435	982
Total all oils	20,817	10,433	7,943
Daily average	694	337	265

*Excludes shipments to territories.

In 1955, residual fuel imports increased more than 100,000 bbl. daily between October and November. The net reduction last November may have represented a cut of as much as 150,000 bbl. daily below planned import levels.

Crude imports from Venezuela averaged 514,300 bbl. daily, only 11,800 bbl. daily under the all-time record set last July.

Other figures show that:

. . . **Greatest decrease** for the month was in crude from Kuwait, down to 87,600 bbl. daily in November from 151,000 bbl. daily in October. The record month for Kuwait was last August with 206,600 bbl. daily.

. . . **Crude from Saudi Arabia** dropped 47,600 bbl. daily; Iraq, 31,500 bbl. daily; and Iran, 31,900 bbl. daily.

. . . **Imports from Canada** decreased 6,600 bbl. daily from the record established in October. The decrease was in deliveries to refineries in Washington.

Exports . . . Crude exports averaged almost 278,000 bbl. daily in November for an increase of 231,000 bbl. daily over October.

The gain in gasoline exports was within the range of normal monthly variations. The only significant product gains were for distillate and residual fuels. Distillate was up 85,400 bbl. daily or 102 per cent. Residual gained 34,200 bbl. daily or 82 per cent.

Exports of lube oils dropped to the lowest level since January 1955.

Path Cleared for Plant Sale

WASHINGTON.—The Government is ready to sell the alcohol-butadiene plant at Louisville with no strings attached.

The House took the first step last week to make this possible. It passed a bill to allow the Federal Facilities Corp. to sell this last splinter of the Government's wartime synthetic-rubber industry without requiring that it be used to make butadiene.

Use of the plant by a buyer will be limited only by a national security provision that it be kept available for 10 years for the making of chemicals important to the national security.

Urging the House to accept the bill, Rep. Carl Vinson of Georgia, chairman of the armed services committee, said he was confident that the new conditions will enable the Government to sell the plant for more than the $3,500,000 previously offered when its use was limited.

The plant is now under lease to Publicker Industries, Inc. That lease expires in April 1958. Several attempts to sell the plant have failed.

Bill Hits at Allowable

BISMARCK, N. D.—A bill to junk the monthly allowable system for oil and gas production has been introduced in the North Dakota Legislature by Rep. Walter Burk.

Burk said the allowable figure is now based on demand of the 30,000-bbl. Standard Oil Co. (Ind.) refinery at Mandan, the state's principal purchaser. He said this discourages new markets which might be developed if wells were permitted to produce at a "maximum permissive rate."

Under the Burk plan, the State Industrial Commission would retain authority to set a "reasonable market demand" only after determining that production was wasteful and was having a demoralizing effect on the oil and gas market. Burk said this would result in a competitive situation which would encourage the drilling of new wells.

Elk Hills Flood Approved

BAKERSFIELD.—Plans for a limited water flood in shallow sands of the Elk Hills Naval Petroleum Reserve have been approved by the House armed services committee.

If other concerned federal bodies approve the proposed contract between the Navy Department and unit-operator Standard Oil Co. of California, two injection wells will be drilled on the south flank. About 30,000 bbl. of water daily are available from north-flank wells. The brine currently is being disposed of through percolation pits.

Purpose of the flood is to prevent crude oil from migrating down structure into low-pressure water sands. When pressures have been restored and the movement checked, the Navy could then shut in south flank wells which are producing about 7,000 bbl. daily.

Amerada Paces Record Sale

REGINA.—Amerada Petroleum Corp.'s offer of $494,805 for four parcels topped the bidding at the biggest sale of oil and gas rights in Saskatchewan's history.

The Saskatechewan Government received $1,230,993 in the January sale to beat the previous record of $612,716 set last October. A total of 1,990,097 acres in 24 parcels were on the block. Amerada's high bid was for 350,240 acres in the Moose Jaw-Avonlea and Edgeworth Lang areas.

OVER 2,300 LANDOWNERS, coveted orchards, and tough hand-ditching made Sicily's . . .

Small Line A Big Job

THE little Mediterranean island of Sicily last year accounted for a 165 per cent boost in Italy's oil production while the Italian mainland, shackled to a government monopoly, made little progress.

Last week, Sicily passed another milestone that will push her production even higher. It was a big occasion for Sicily. Government officials, Gulf Oil Corp. officials, and U. S. Government representatives turned out for the dedication of a pipeline that would probably pass unnoticed in the United States.

The 40-mile, 14-in. crude line to link Gulf Italia's field at Ragusa with a refinery at Augusta was officially dedicated. Since the Gulf subsidiary discovered the field in October 1953, Ragusa has been developed steadily, but slowly. The heavy 12° to 16°-gravity Ragusa crude had to be transported to the 44,000-bbl. RASIOM refinery at Augusta by rail. It was a slow process.

Today the field has 18 wells and is producing about 18,000 bbl. daily. With the pipeline completed, that will jump at least 3,000 bbl. daily and keep increasing with the field's development.

Last week's ceremonies were in keeping with the importance of the event to Sicily. Present for the dedication were Giuseppe La Loggia, president of the Silician regional government; John D. Jernegan, American minister in Rome who represented the U. S. ambassador; C. W. Hamilton, chairman of the board of Gulf Eastern Co., London; and representatives of the North Atlantic Treaty Organization, the Sicilian Government, and Italian industries.

Construction problems . . . The work done to lay the line and give Sicily's production such a boost would make a modern pipeliner shudder in despair. The line traverses the southeastern corner of the little island for a distance of just a little more than 66 km.

But, in acquiring the right of way for that 41 miles of line, Gulf Italia had to deal with more than 2,300 landowners. Olive, orange, and almond trees on the land have been nurtured for generations. This created all kinds of right-of-way problems. In more than one instance, Gulf ran the line under olive trees more than 100 years old without disturbing them.

Because of the delicacy of this operation and the fact that much of the terrain crossed is almost entirely limestone, most of the line was ditched by hand. There was very little "soft digging" and almost no heavy machinery used.

Gulf completed the pipeline and put it into operation less than a month after it pulled out of the Italian mainland entirely. The company had warned earlier that it would leave Italy if a proposed oil law were passed. When Italy approved the unattractive law, Gulf bowed out, leaving its operation on the mainland in the hands of Montecatini, the Italian chemical firm that was its partner in Petrosud, S.A. *(The Oil and Gas Journal, January 28, page 137).*

Sicily's regional oil law of 1950 is much more liberal in terms granted private oil companies than is the mainland's new law.

Sahara Wins Favor

Nasser reassures U. S. firm as Neptune resigns his post

THE American company spending $500,000 a month looking for oil in Egypt's vast western desert won't be "Egyptianized."

Sahara Petroleum Co. officials said last week in Cairo they have been assured by Col. Nasser's government that they have nothing to fear. The government told them the $25 million the company has spent in the last 3 years in Egypt can be considered a good investment. No oil has been found, however.

The Egyptians announced weeks ago they were seizing the production and refining assets of the Anglo-Egyptian Oil Fields, Ltd., in which the Royal Dutch-Shell Group and British Petroleum Co. both have interests.

Announcement that the American prospecting company will fare better than the British interests in Egypt was made in Cairo at the same time Millard Neptune, general manager of Sahara, announced he's quitting. Neptune is returning to the United States. He emphasized last week that his leaving means no change in company policy in Egypt.

Neptune will be succeeded by Cuth Kenneth Shepherd, who has been assistant general manager.

Sahara, owned by four large American independent companies, pulled its people out of Egypt and left three rigs idle when the British-French-Israeli forces invaded the country late in October. They returned in mid-December *(The Oil and Gas Journal, December 17, 1956, page 107).*

Sahara, formerly Egyptian-American Oil Co., is owned by Continental Oil Co., Cities Service Co., Ohio Oil Co., and Richfield Oil Corp. It has abandoned two deep dry holes since it began operations 3 years ago. In the first near Alexandria, bottomed at 13,300 ft., a noncommercial oil show was found. No shows have been reported in any of the other tests.

Oil for the West is the appeal as . . .

Israel Plugs for Line to Bypass Canal

IT'S not being done officially. But Israel is dangling what she hopes will prove tempting bait before an oil-hungry western world. The move is part of Israel's effort to hang onto some of the gains made in fighting with Egypt.

The Israel-Egyptian problem has two facets.

Here's what is happening in the foreground:

The United Nations last week was battling over the wording of a new set of resolutions. A pair of them are designed to pressure Israel into withdrawing from Egyptian territory. No one can agree on just how effective either will be.

The main idea is to persuade Israel, diplomatically, to pull back to the Israeli-Egyptian armistice line of 1949. Israel won't agree without some guarantee that her present positions on the Gulf of Aqaba and the Gaza strip are protected after she withdraws.

Gaza is largely political, in spite of Israeli charges that it could be used again as a launching site for guerilla raids on her territory. The Gulf of Aqaba is something else again. Israel regards freedom of this tiny gulf and the shipping it could bring to Israel as vital. She won't give it up without a scrap.

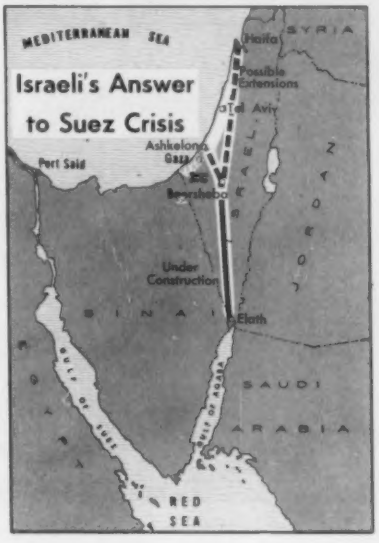
Israel's plan . . . It's on this point that the Israelis are working adroitly behind-the-scenes.

They are plugging away at the idea that the port of Elath, on Israel's southern tip, must be kept open for shipping without Egyptian interference. To support this contention, they offer a "short" route for an oil pipeline that would bypass the Suez Canal. It's much shorter than proposed lines from Middle East fields through Turkey to ports on the eastern Mediterranean.

The entire Israeli position on such a pipeline falls apart, of course, if the Egyptians are once again able to close Aqaba to shipping. Because Israel needs the southern port free for other shipping, she is quietly pressing its possible value for oil shipment. She hopes to enlist the support of other nations who could benefit from the oil movement.

One supporter . . . France is sold completely.

French Foreign Minister Christian Pineau has told the French Parliament flatly that his government is not only supporting a large-diameter pipeline from Elath to Haifa, but will be active in building such a line *(The Oil and Gas Journal, December 24, 1956, page 56).*



Neither Pineau nor any official of the French Government has revealed any concrete plans for the line. Last week, both the French and Israelis were officially silent on any future plans.

Propaganda weapon . . . With the Suez shutdown and the United Nation's wrestling with the problem of restoring peace in the Middle East, Israel is using the possibility of a short-route pipeline in every way she can.

Oil industry figures generally agree that more pipelines must be built in the Middle East to meet Europe's rising demand whether Suez operates at capacity or not. Israeli spokesmen use this theme privately to try to consolidate their country's position.

Two new large-diameter pipelines have been proposed to give Middle East oil an outlet. Both were talked before the Suez Canal was closed. One of these proposed lines would move northward from the head of the Persian Gulf and westward through Turkey to the Mediterranean, skirting Syria, the political bottleneck of the present systems. The line theoretically could move Kuwait, Iranian, and possibly southern Iraq crude to the Mediterranean seaports.

The other line, as proposed, would be built northward from Iraq's prolific fields and west through Turkey to the Mediterranean *(The Oil and Gas Journal, December 3, 1956, page 66).*

Israeli spokesmen in this country like to contrast the route they offer with these two. They give a convincing argument from the standpoint of distance and cost that a line from Elath to Haifa would be simpler. In fact, the Israelis claim they could lay four parallel 32-in. crude lines from Elath to Haifa at about the same cost of one of the lines through Turkey.

The line through Israeli would have to be served by tanker hauls from the Persian Gulf, around the Arabian Peninsula, and to the Gulf of Aqaba. The other proposed lines, of course, would link the producing fields themselves with the Mediterranean.

Source of supply . . . Since the Israeli pipeline first reared its head several months ago, the most frequent industry question has been: Where is the oil coming from?

This is based on the very valid theory that if the oil-producing Arab nations won't permit their production to be shipped to Israel, how could they be expected to permit Arab oil to move through an Israeli pipeline, even if it is ultimately bound for Europe.

Israeli spokesmen shrug this off as no real problem. They are quick to insist that the oil-producing nations of the Middle East are not responsible for the oil embargo on Israel. They blame Egypt and its ban on Israeli shipping in the Suez Canal.

To bolster this argument they point out that Kuwait, the Middle East's largest oil producer in pre-Suez days, is not a member of the powerful Arab League which aims most of its activities at stifling Israel. Iran, another major oil producer, is Moslem, but not Arab. Iraq, a third major producer, is widely regarded as the least pro-Egyptian of the entire area.

In short, the Israelis believe they can get Middle East oil without any real trouble if they don't have to move it through Egypt. They hinted pretty broadly that they have been getting at least some Middle East oil all along.

Small line already laid . . . Israel is now building an 8-in. line over about the same route that would be followed by a large-diameter line. (See photo.)

Work on the 150-mile project was started a few weeks ago after Israeli troops secured all the Sinai Peninsula in their campaign against Egypt. Egyptian shore batteries on the southern tip of Sinai and on small islands

ARMED WELDER is a familiar sight along the 8-in. line Israel is now laying from Elath, on the Gulf of Aqaba, to the Haifa refinery. The project is scheduled for completion in March.

in the Gulf of Aqaba made any such project impossible before.

The line will serve a twofold purpose if Israel can keep the port open. It will move enough crude northward to the Haifa refinery to satisfy Israel's needs. It will also demonstrate, the Israelis hope, just how practical a larger line would be. The French were talking in terms of a 30-in. line to move 400,000 bbl. daily before the project dropped from public discussion. Israel is building the 8-in. line herself because she had the pipe to do the job.

The first stage of construction will take the 8-in. north to Beersheba, where it meets the railroad. Later projects might take it north and west to the Mediterranean, or to Haifa (see map). If the line is extended, the size probably will be increased to take production from Heletz field, the country's first oil production.

If the line is built on to the coast, it would mean a very short shuttle-tanker run from Haifa down the coast to the terminus on the sea. Israel's tankers are aged and would fit this type of service much better than a trans-ocean voyage of any kind.

The line now under construction passes just a few hundred yards from the Jordan border and crosses some of the touchiest spots between Israel and her Arab neighbors. A rifle is standard gear for welders on the job.

Israel hopes its own pipeline building job may give someone in the western world an idea of just how easy it would be to do the job on a large scale. Israelis say keeping Aqaba open to shipping would keep another oil supply route open to the West. The point they leave unsaid is that this would also give the West a stake in keeping the port open and Israel would benefit more than anyone else.

Costa Rican Test Spudded

Union Oil Co. has spudded a new test in Costa Rica after abandoning its 2 Cocoles near the Panama border.

The 3 Cocoles is in the same area as the No. 2 well, which flowed 1,000 bbl. daily on initial test. It was plugged after making increasing amounts of salt water.

Union has also abandoned its 1 Yorkin in Panama after drilling to 5,500 ft. The test had good shows but no oil. Union will transfer the rig to Guatemala, where a joint venture is planned with other major firms.

The closing down of the 1 Yorkin ended all drilling operations in Panama. Caribbean International which had drilled shallow tests in the Darien area near the Colombian border, halted operations in December.

Greek Wildcat Set

Three firms will spud test on Zante Island in spring

ISRAEL Mediterranean Petroleum, Inc., and Pan-Israel Oil Co., Inc., are shipping a shallow drilling rig to the island of Zante (also known as Zakynthos) to explore a concession of about 120,000 acres.

The Greek Government recently approved an agreement under which the two companies will act as operator on an equal participation basis with American-Grecian Oil Co., Inc. The two Panamanian companies have been active in Israel.

The entrance of the two operating oil companies on the Grecian scene apparently means that a 26-year-old would-be St. Louis oil man is going to get his operation off the ground after several delays. American-Grecian Oil Co. was organized more than a year ago by Martin Lerman, a youthful American who obtained the concession from the Greek Government and several private owners of the little island in the Ionian Sea *(The Oil and Gas Journal, October 24, 1955, page 77)*.

Confirming the farmout agreement last week, Benjamin Heath, president of Israel-Mediterranean, said the three companies are applying for additional concessions on other Ionian Islands, including offshore acreage adjoining Keri on the southern tip of Zante.

History . . . Zante is the southernmost of the group and is only about 12 miles west of Greece's Peloponnesus Peninsula. The oil seeps at Keri provided the Ancient Greeks with an important source of asphalt. Historians believe the Keri seeps provided the pitch to caulk the ships which conquered Troy.

A Greek firm discovered some shallow production on the island in the early twenties, but was never successful in making a commercial field out of it. During World War II, the Germans drilled several shallow wells on the island and produced them until the Allies landed in Sicily. The Germans destroyed the wells and withdrew.

Heath said last week this German production was from a series of shallow sands. The new program will look for deeper production.

Heath's company and Pan-Israel have agreed to spend $150,000 and drill about 15,000 ft. of hole within the next 3 years. After that original $150,000 has been spent, American-Grecian will share all exploratory costs equally with the two operating companies.

The first well will be spudded some time in the spring.

Aluminum Line Set for Jungle

A 42-MILE aluminum pipeline—the longest ever built of this metal—will be laid in the jungles of Colombia.

The 6-in. line planned by Colombian Petroleum Co. (Socony Mobil and Texaco) will transport crude from Tibu field, near the Venezuelan border, to a tank farm at Rio de Oro. Pipe in 40-ft. sections was shipped last week from the Phoenix extrusion plant of Reynolds Metals Co.

One major reason for choosing aluminum is that it is available. Steel is not. Colpet figured it could have the aluminum line laid a year before a steel line could be completed.

Besides being available, the light metal is easy to weld. The joints weigh only one-fourth as much as comparable steel pipe, so shipping and handling costs are lower. The light pipe also will be strung easier and faster along the twisting road which forms the right-of-way in the eastern Colombia jungle.

Mid-East Employes Get the Ax

IRAQ PETROLEUM CO., LTD.'S, pipeline troubles also are the personal problem of a large share of its employes in Syria and Lebanon. A total of 4,050 have been dismissed, or are in the process of being discharged.

The company has kept only 450 out of 3,700 workers in Syria. Eight hundred employes in Lebanon either are getting final notices, or have them already. This amounts to one-third of I.P.C.'s Lebanese force.

The dismissals were due to the failure on the part of the company to obtain permission from the Syrian Government to reopen crude lines to the Mediterranean.

Once repairs get under way, the lines within a week could handle 220,000 bbl. daily from Kirkuk and smaller fields in northern Iraq. Syria has said it will not allow repairs until Israeli forces have withdrawn from the Gaza Strip and Sinai Peninsula.

In Lebanon, dismissals are not confined to Lebanese employes. A large proportion of British employes are included. Wages and salaries paid in Tripoli since the beginning of November have amounted to $2,100,000. No crude has been exported from the terminal in 3 months.

Employes are receiving the statutory discharge-notice pay and indemnity in accordance with the Lebanese labor law. Some will get as much as 2 years' pay.

Work for 400 employes at the company's 11,550-bbl. Tripoli refinery will continue—at least until crude supplies are gone.

Syria collects . . . I.P.C. has made a royalty payment of $13,700,000 to the Syrian Government. This covers the transit of oil through Syria in 1956, up to the night of November 2 when pumping stations were destroyed.

The company did not waive its right to claim compensation for damages.

Shell Hunts Barge

Freak accident won't stop Persian Gulf exploration

LOSS of a $2-million mobile drilling barge in a freak Persian Gulf accident will not stop Shell Co. of Qatar's efforts to find offshore oil.

Officials of the Royal Dutch-Shell Group made the decision last week in London. There had been some feeling that the accident would halt the program in which Shell has already invested $21 million.

The 1,900-ton platform was damaged almost beyond repair late in December by freak winds and Persian Gulf currents as it was being towed to a new location.

The decision to continue operations hinges on finding another platform. The company estimates it would take at least 2 years to build another one and hopes to contract for one already in use.

When another platform can be found the next well will be drilled in the north half of Shell's concession area. It will be 35 miles from the nearest land and about 65 miles north-northeast of Doha in 80 ft. of water.

Shell obtained its Qatar offshore concession in 1952. Two dry holes were drilled after 18 months of geophysical work. The rig accident occurred as the platform was being moved to a third location.

Second Libyan Test Planned

Libyan American Oil Co. will drill its second test in Libya using air circulation.

A camp is now being set up for the wildcat. The site, near Marua, is 50 miles east of the company's first test. Drilling is expected to be under way by March 1.

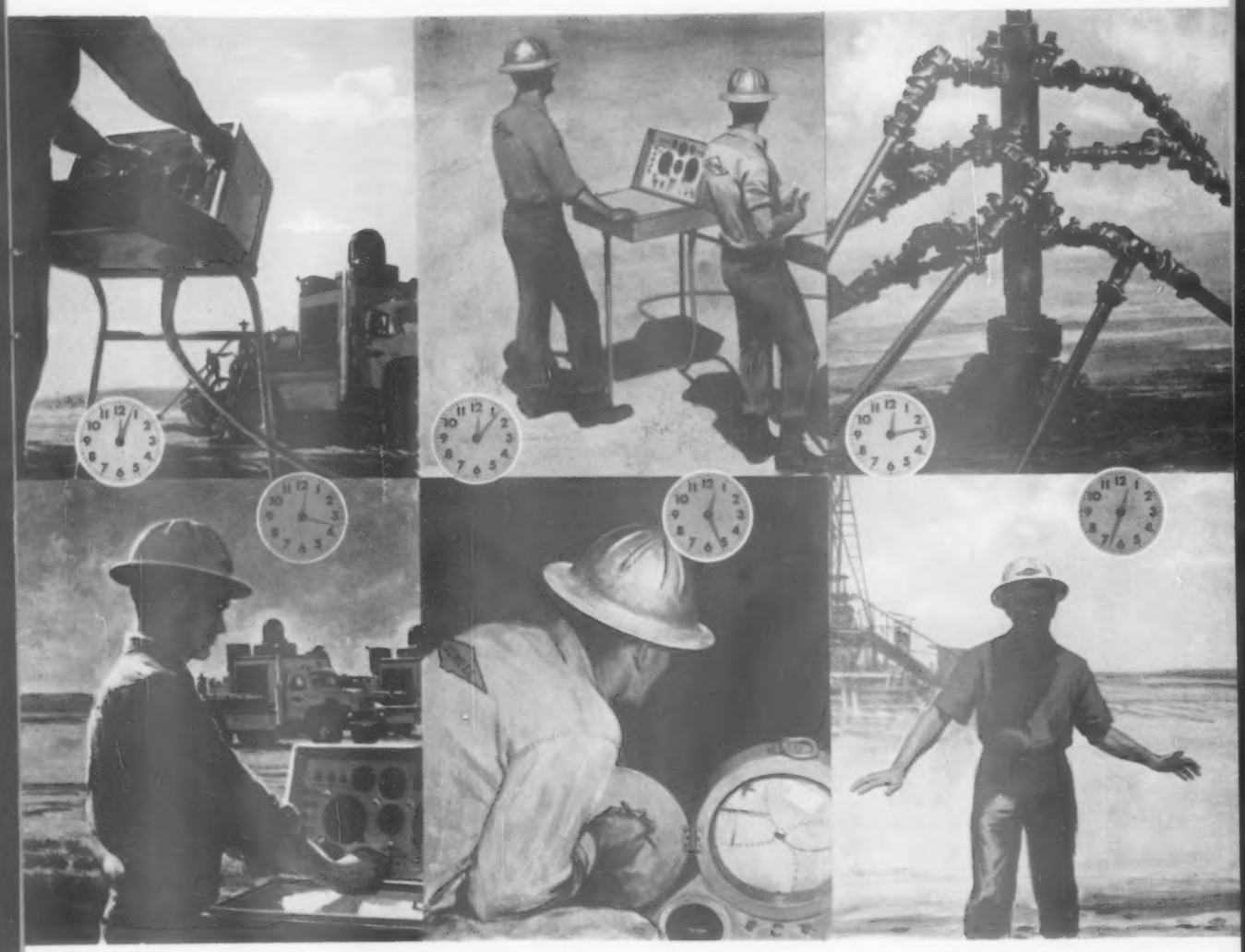
The first well, located in northern Cyrenaica east of Bengasi, was abandoned as a dry hole at 9,700 ft. It was drilled with water. There were no shows.

An air compressor will be installed on the rig for the new test, and dust will be circulated through the hole. The Texas Gulf Producing Co., subsidiary decided to try air drilling because no water courses were found anywhere in the first test.

Air drilling is cheaper, but it works only if no water is found down hole. No surface water is available in the area, and the company will save the high cost of hauling water supplies long distances to the rig.

Mud will be standing by, however, in case it is needed.

High-injection-rate fracturing . . .



Recent field experience has proved the economic soundness of large volume, high-injection-rate Dowell fracture-type treatments on oil and gas wells. These "big jobs" have been highly successful for retreatment in wells where smaller treatments have been used. They are often effective where small jobs have failed.

When they could be used within the limits imposed by well equipment, big treatments have given consistently good results. High effective permeability and a high productivity index are common after big, high-injection-rate treatments.

This means low lifting costs, high initial production, a slow rate of production decline, and a long period of production between workovers. These advantages more than balance the slight additional cost of the "big jobs".

Dowell is a pioneer in large volume, high-injection-rate fracturing. Even today, Dowell Engineers are planning and executing fracture-type treatments that would have been considered fantastic just a few months ago.

From Dowell, you can get everything you need for the "big jobs". You get research facilities, advanced equipment, and trained personnel. Most of all, you get experience without parallel in the industry.

Dowell Incorporated, Tulsa 1, Oklahoma.

Services for the oil industry

DOWELL

A SERVICE SUBSIDIARY OF THE DOW CHEMICAL COMPANY

It takes all kinds of people to frac a well

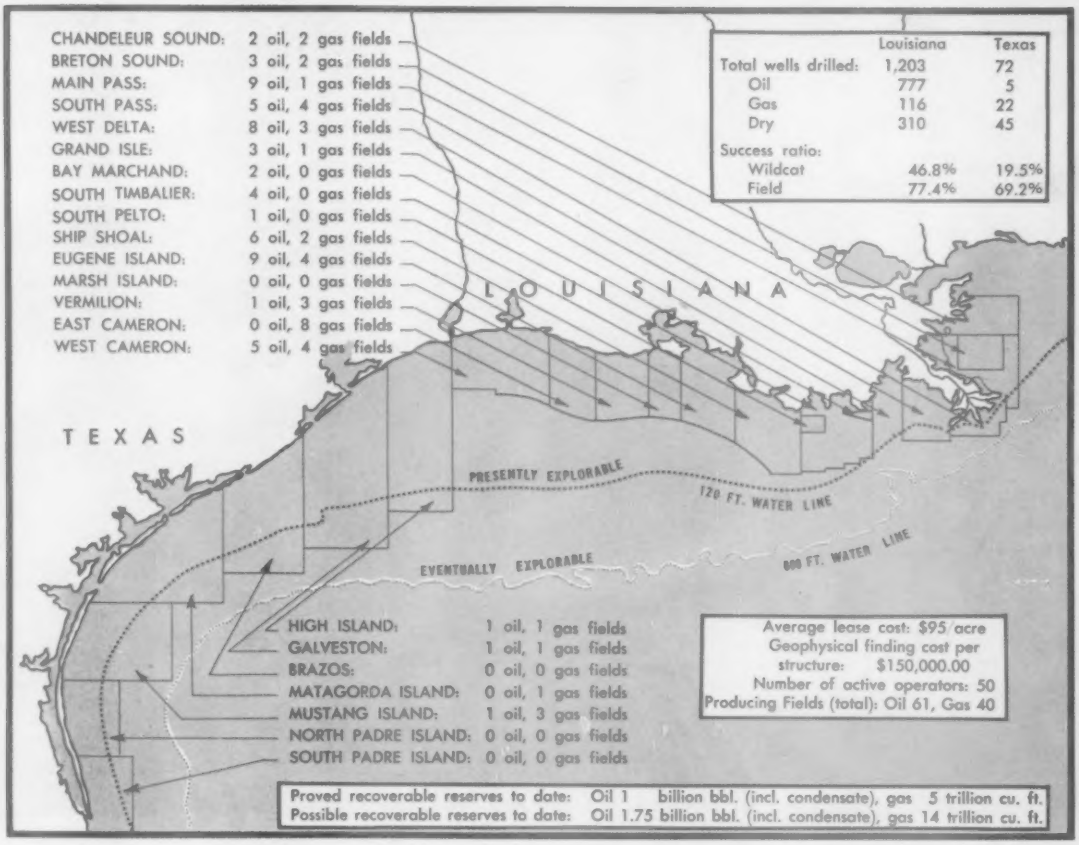
And at Dowell we have just the people it takes. We have the technicians, the engineers, and the scientists—the men who are needed to keep giving the right answers to your problems.

Every day we're solving these problems—speeding up payout, increasing recovery. But, certain difficult oil and gas wells require creative engineering and imagination. You'll find that this extra degree of skill and ability at Dowell is firmly grounded on experience, technical knowledge, and research. Imagination is one more extra you get from Dowell. Dowell Incorporated, Tulsa 1, Oklahoma.

Services for the oil industry

DOWELL

A SERVICE SUBSIDIARY OF THE DOW CHEMICAL COMPANY


CHANDELEUR SOUND: 2 oil, 2 gas fields
BRETON SOUND: 3 oil, 2 gas fields
MAIN PASS: 9 oil, 1 gas fields
SOUTH PASS: 5 oil, 4 gas fields
WEST DELTA: 8 oil, 3 gas fields
GRAND ISLE: 3 oil, 1 gas fields
BAY MARCHAND: 2 oil, 0 gas fields
SOUTH TIMBALIER: 4 oil, 0 gas fields
SOUTH PELTO: 1 oil, 0 gas fields
SHIP SHOAL: 6 oil, 2 gas fields
EUGENE ISLAND: 9 oil, 4 gas fields
MARSH ISLAND: 0 oil, 0 gas fields
VERMILION: 1 oil, 3 gas fields
EAST CAMERON: 0 oil, 8 gas fields
WEST CAMERON: 5 oil, 4 gas fields
Louisiana Texas
Total wells drilled: 1,203 72
Oil 777 5
Gas 116 22
Dry 310 45
Success ratio:
Wildcat 46.8% 19.5%
Field 77.4% 69.2%
LOUISIANA
TEXAS
PRESENTLY EXPLORABLE
120 FT. WATER LINE
EVENTUALLY EXPLORABLE
600 FT. WATER LINE
HIGH ISLAND: 1 oil, 1 gas fields
GALVESTON: 1 oil, 1 gas fields
BRAZOS: 0 oil, 0 gas fields
MATAGORDA ISLAND: 0 oil, 1 gas fields
MUSTANG ISLAND: 1 oil, 3 gas fields
NORTH PADRE ISLAND: 0 oil, 0 gas fields
SOUTH PADRE ISLAND: 0 oil, 0 gas fields
Average lease cost: $95/acre
Geophysical finding cost per structure: $150,000.00
Number of active operators: 50
Producing Fields (total): Oil 61, Gas 40
Proved recoverable reserves to date: Oil 1 billion bbl. (incl. condensate), gas 5 trillion cu. ft.
Possible recoverable reserves to date: Oil 1.75 billion bbl. (incl. condensate), gas 14 trillion cu. ft.

OFFSHORE REPORT

Today's BIG Oil Frontier . .

. . . the Gulf of Mexico

THE most promising place to look for a giant field is the offshore area. Thus far, according to one authority,* 1 of every 20 offshore wildcats has turned up a field with more than 50,000,000 bbl. of reserves; only a small fraction of 1 per cent of onshore wells have such success.

Oil reserves aren't the only high figures offshore—leasing and production costs are high, too. Up until now, average cost of offshore leases has been around $95 per acre, but some tracts in recent lease sales have gone for as much as $2,000 per acre. Still, the chances of finding production are much greater than onshore.

*See The Oil and Gas Journal, November 19, 1956, p. 139.

THE PROSPECTS . . .

Twelve billion barrels in eventual oil reserves, an amount that is equal to 42 per cent of the proven reserves in U.S.A. land fields.

One billion barrels are now in proven offshore reserves.

5 to 14 trillion cubic feet are now in proven offshore gas reserves.

THE ANTE . . .

Industry expenditure to date $1,600,000,000.

Anticipated expenditure over next five years up to $2,000,000,000.

40 per cent of the total offshore activity to date has taken place in the past 15 months.

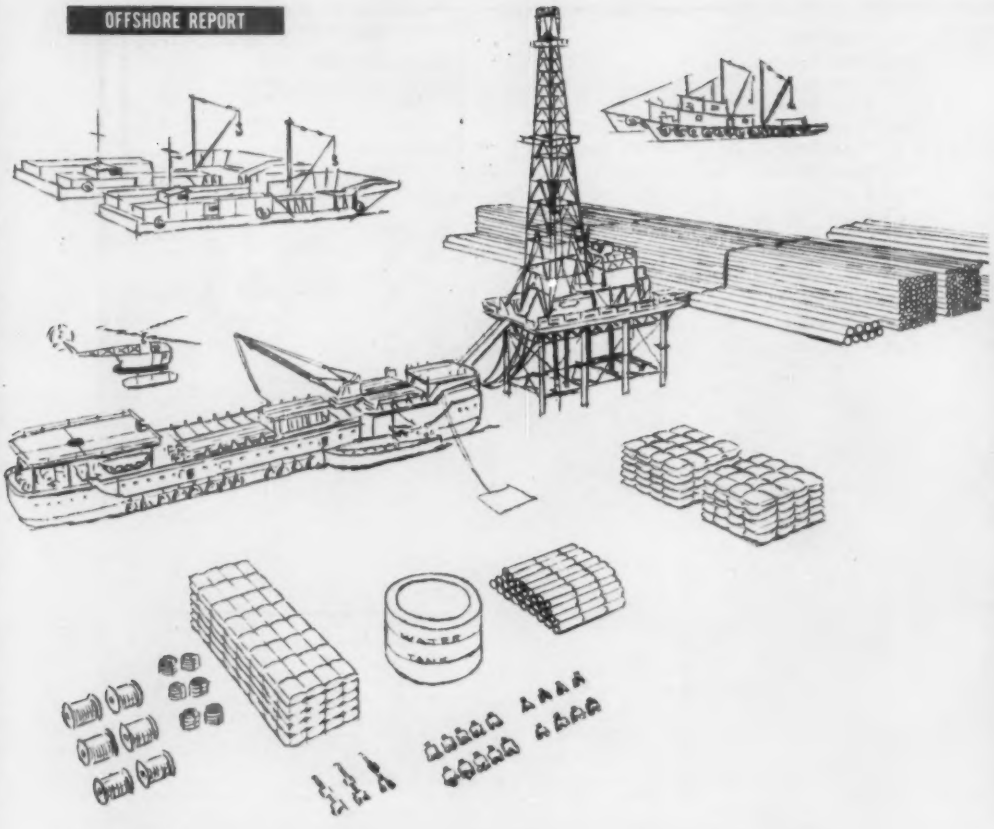
THE TAKE . . .

101 oil and gas fields have now been discovered.

156,900 barrels of oil produced daily.

343,000,000 cu. ft. of gas produced daily.

Total daily product value about $475,000.



4 TO 10 FEET

Here's what's required to drill one 10,000-footer . . .

1,000 tons of construction steel for platform
554 tons of casing and tubing
7,500 ft. of 1⅛ to 1¼-in. cable
25,000 ft. of sand-line cable
2 tons of welding rod
30,000 bd. ft. of decking timbers
1,300 gal. of diesel oil
4,000 sacks of cement
10,850 sacks of drilling-fluid additives
80,000 bbl. of fresh water
Storage tanks for water, product, and fuels

And here's

4 to 10 Ft.

BARGE
Submersible self-contained drilling barge requires a 300-ton steel production platform.

Any offshore operation is big time,

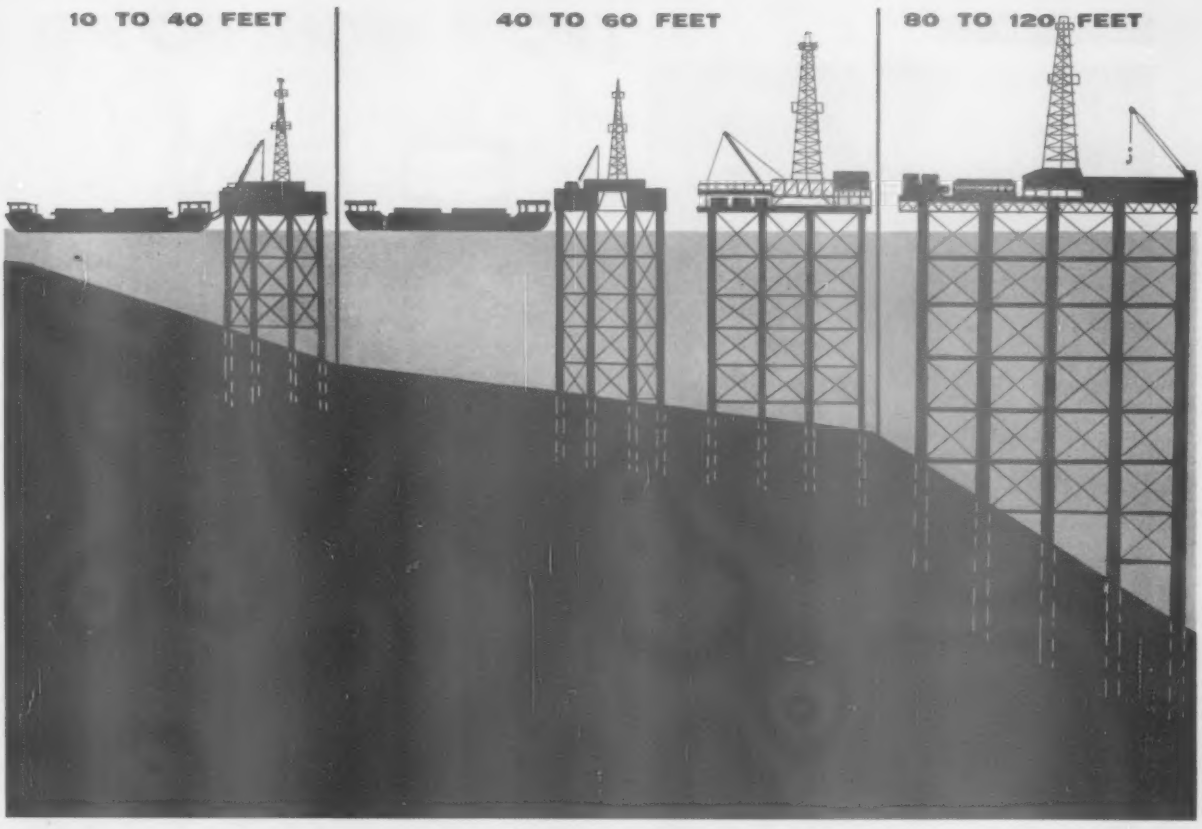
Drilling and equipping a well at sea means spending eight or nine times as much as for an inland well. Happily, though, the average offshore well taps eight or nine times as much oil.

One operator recently put up a permanent, self-contained platform in 94 ft. of water, 15 miles off the Louisiana coast. Simply to build the platform took 1,400 tons of steel and cost more than $1,500,000; cost of drilling wells was extra. A mobile drilling unit to drill in this depth water would cost more than $3,000,000 to build; and rental plus other costs on such a unit would be more than $10,000 per day. Even if oil were discovered by the mobile platform, the operator would still be faced with building a permanent platform for production.

Biggest threat to offshore operations, other than recurring political disturbances, are hurricanes. Most pieces of equipment are designed for a 50-year operation life, not considering hurricanes. And, design for this is to withstand the worst hurricane that could be expected in a 25-year frequency.

The summer of 1956 brought the first real trial-by-hurricane for the entire range of modern offshore equipment. Fortunately, there was only light damage. Part of the credit goes to good design; part is due the fact the full strength of the hurricane passed over only a narrow belt of the oil area.

Come in many styles . . . Structures for drilling overwater wells are anything but uniform. First units to



a look at construction needed in Gulf of Mexico drilling

10 to 40 Ft.

TENDER AND PLATFORM
These require a 650-ton steel platform and an LST.

40 to 60 Ft.

TENDER AND PLATFORM, AND SELF-CONTAINED FIXED PLATFORMS
Tender and barge platform require an 850-ton steel permanent platform. Self-contained fixed platform requires 1,000 tons of steel in substructure.

80 to 120 Ft.

UNDER PLATFORM
Self-contained fixed platform requires 1,200 to 1,500 tons of steel in substructure.

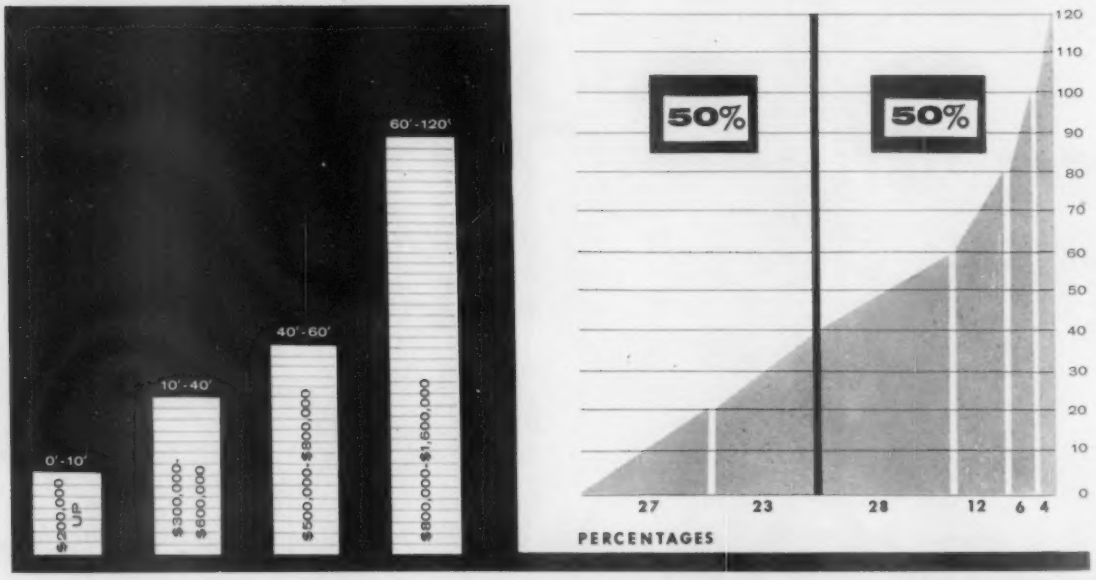
but as depth grows, so does the cost

venture offshore were the shallow-water submersible barges that had drilled marsh locations in South Louisiana for many years. These units do a good, cheap job in shallow, protected waters. For deeper, unprotected water, the LST's from World War II were brought in to serve as tenders to small platforms big enough to hold only the drilling rig. Advantage of this arrangement is, of course, that the investment in platform is low and that the tender can be moved to a new location when drilling is completed.

As drilling moved into still deeper water, the platforms had to become bigger in order to be strong enough. In fact, they became so big it was possible to put all machinery and crew quarters on the platform with the rig and to do away with the tender.

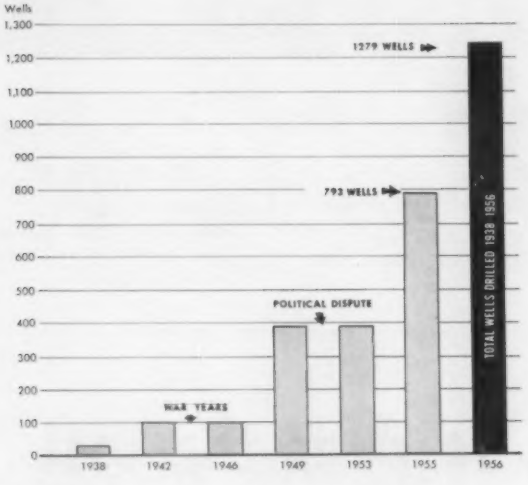
Most operators have kept their mobile units narrow enough that they can be moved through the intracoastal canal. Ability to move through the canal is a great convenience but the long, narrow shape that results causes problems of its own. A submersible barge for deep water needs stabilizing devices to keep it upright if it has the restricted width. Since these stabilizing devices are expensive to build and maintain, two of the newest submersible barges have pushed out width till it is almost as great as length. The greater width makes the units completely stable in their operating depth, but it also dictated a steel requirement of about 4,000 tons each for construction.

Most of the offshore leases already granted are in relatively shallow water. For that reason, little of the



Platform costs in relation to water depth

50% **of the Gulf Coast oil fields lie in waters over 40 ft. in depth. Self-contained fixed platforms are preferred by operators for developing fields in these deep-water areas.**



The boom in offshore drilling

45 major companies are now represented in the gulf . . . 25,000 wells are needed to develop known and proved substructures.

drilling in the near future will be in water of extreme depth. However, there's little reason to suspect that in a few years wells won't be drilled with present techniques in waters as deep as 250 ft.

The floating-type drilling platform now being used for core drilling off California should be able to drill in waters of 600-ft. depth and deeper. This potential should open up even more of the submerged lands to exploration and development. The floating vessels have not been widely tested on the Gulf Coast, but time should see the solution of the problem of adapting the method to the heavy seas and rough weather there.

Acknowledgment

Acknowledgment is paid to J. B. Beaird Co., Shreveport, which compiled much of the data and prepared many of the illustrations in the article. This company performed a fine oil-industry service in pointing out the large quantities of steel which will be required for the expanded offshore drilling-production program.

NEEDED . . .
in the next 5 years
2,500,000 tons of steel

3,650 offshore wells will be drilled.

561,920 tons of steel will be needed for fixed-platform substructures already indicated in 1956 to 1961 drilling forecasts.

About 2,000,000 tons of steel in casing and tubing will be needed for these wells.

These are the rigs that will drill them:

Mobile units—1,000 wells.
587,280 tons of steel.
Platform and tender units—1,000 wells.
695,100 tons of steel.
Self-contained fixed platforms—1,650 wells.
1,326,600 tons of steel.

THE OFFSHORE STORY . . .

. . . as told in the pages of The Oil and Gas Journal in 1956-57

1956

	Date	Page
New method for Coating Offshore Pipelines—P. H. Timothy	1- 2	70
Big Barge Readied for Work in 100-Ft. Water	1-23	54
Drillers' Ideas Awaited on Offshore Insurance	1-30	122
First Barge to Invade California Water	1-30	129
Humble Uses Own Design in New Mobile Platform	2- 6	56
Work Clothes Added After Zapata's Tripod Rig Gets Feet Wet	2- 6	61
Mr. Gus Will Be Used to Drill 63 Miles Offshore	2- 6	65
Kuwait Looks Offshore	2- 6	76
C.A.T.C. Offshore Group Test Slated in 112 Ft. of Water	2-13	78
Stanolind Top Bidder As Mobile Bay Play Near	2-20	90
Offshore Bids Run High for Louisiana Coast Drilling	2-20	97
Offshore Risks High But Industry Still Betting Gulf Will Be Prolific Oil Country	2-27	78
Shell Oil's Twelve-Well Platform Put to Work Off Coast of St. Mary Parish	2-27	87
How Richfield Is Core Drilling From a Floating Barge—D. H. Stormont	2-27	130
Permanent-Type Completion Pays Off Offshore—Ed McGhee	3-12	102
Zapata's Three-Legged Platform Ready for Work	3-19	121
Core-Drilling Barge Pays Off for Richfield	3-19	125
Phillips Strike Made 40 Miles Offshore	3-19	131
Navy Plans Oil Search on San Nicholas Island	3-19	132
161 Tracts Off Louisiana and Texas Up for Sale May 15	3-26	77
Muskrat Line Crosses 130 Navigable Bodies of Water to Link T.G.T. System with Big Louisiana Fields	4- 2	76
Zapata Unit Towed to Sea and Anchored for Drilling	4- 9	77
New Calco Barge Is on the Job	4- 9	78
New Firm Goes Offshore	4-16	125
Wilshire Completes Marine Pipeline	4-23	73
Latest in Mobile Drilling Platforms Goes to Work—Ed McGhee	4-23	129
Delta Drilling Forms Firm to Handle Offshore Work	5- 7	100
Seventy Wells Will Drill From This Island Located 1½ Miles Offshore From Seal Beach	5-14	140
Dry Dock Floats Offshore Rig	5-28	96
Deep-Water Giant Spuds First Test	6- 4	64
With Hurricanes Offshore, Crews to Help Spot Storms	6-11	85
A Steel Curtain for Drillers Calms Rough Waters	6-11	92
2. Case History—Gulf Oil's Marine Tests on Automatic Control of Production—C. R. Bayless	6-11	129
Offshore Drilling Facing Slowdown	6-18	136
No. 1 Gulf Field Growing Fast	6-18	139
Louisiana Gas Well on Rampage—Loss Expected to Hit $2 Million	6-18	144
Parley Will Set Rules for California Offshore Wells	6-18	147
Shell Gets Pakistan Tidelands	6-18	150
T.G.T.'s Muskrat Line 80 Per Cent Submarine—And Here's How the Pipe Laying Is Being Done—Paul Reed and Robert G. Deering	6-18	170
Offshore Lines—Newest Challenge to Pipeliners	6-18	174
What's Involved in Planning and Constructing an Offshore Pipeline—Clyde Aldridge	6-18	174
What Happens in an Offshore Blowout	6-25	66
Three-Way Deal Brings New Offshore Tools	6-25	76
Drilling Firms Enlarge Their Offshore Fleets	6-25	78
Offshore Relief Likely as U. S. Officials Expected to Go Along With Louisiana Pending Decision on Boundary	6-25	79
Clues to Oil Found in Young Gulf Sands	6-25	80
3. Case History—Gulf Oil's Marine Tests on Automatic Control of Production—C. R. Bayless	6-25	100
Offshore Tests Share Interests in California Exploration—Bill Smith	7- 2	158
Union Squelches Report of Phantom Offshore Well	7- 9	62
Sinclair Hits in Deep Water	7- 9	63
Casing Set in Offshore Hole	7- 9	69
Mr. Gus Shines in Deepest-Water Test	7-30	120
C.A.T.C. 10 Years Old	7-20	130
Secrecy Lifted From New West Coast Barge	7-30	132
Computers Speed Structural Calculations—E. W. McMillin and R. W. McDonald	7-30	242
Oil Men Enter Tidelands Dispute	8-13	80
Drilling Firm Goes Offshore	8-13	84
Freighter Now a Drilling Tender	8-13	85
Capsized Barge Poses Problem	8-20	107
World's Largest Draw Works Stationed in Louisiana Gulf	8-27	74
Barge Still Riding on Back	8-27	76
Big Crane to Help Upright Overturned Drilling Barge	9- 3	66
First Gulf-Type Platform Will Work Off California	9- 3	69
Richfield May Have Major Strike Off Santa Barbara	9- 3	78
Shell Plans to Use First Portable Diesel Electric Rig	9-10	92
First of Two Drilling Isles to Go Up Offshore from Rincon	9-17	120
Crane Tugs at Capsized Barge and by Night It's Flipped Upright	9-17	126
Cash Fight Settled Between State and Long Beach	9-17	127
Flossie Tough on Offshore Oil	10- 1	55
Drilling in Water 600 Ft. Deep Forecast by Shell Engineers	10- 1	56
California Hearings Bring Denials and Accusations That Offshore Core Holes Are Being Drilled Below Legal Limit	10- 1	65
Kerr-McGee's Radical Mobile Drilling Platform New Offshore Workhorse	10- 8	118
Most Powerful Rig Ever Built Is Morris & Hamilton, Inc.'s New Offshore Rig—Ed McGee	10- 8	204
Apco Rig Breaks Calm Off Louisiana	10-22	70
"St. Louis" Ready for Work	10-22	80
Kermac Rig Put to Work at Good Time	10-29	64
Louisiana Given $6 Million for Blocks Near Good Well	10-29	71
Shell, Humble Hit Offshore of Louisiana	10-29	71
Railway Equipment Performs for Phillips—H. D. Redding	10-29	92
Mobile Offshore Co. Formed	11- 5	65
Kermac Plans New Spectacular	11 -5	68
Oversized Farm Tool "Plows" a Pipeline in Louisiana Bay	11-12	134
New Pipelining Process Is Put to Work	11-19	140
California Keeps Oil Stake in Checkerboard Offshore Leases	11-19	141
Continuous Velocity Log—Eric M. Denton	11-19	224
New Seismic Technique Promises Better Results in Difficult Areas	11-19	267
West's First "Gulf" Platform	11-26	56
Sea Mounds May Lead to Deep-Water Oil Reserves	11-26	58
Zapata's Scorpion Has Big Brother	11-26	61
Giant Barge Gets Shakedown	12- 3	64
California Drilling Fleet Expanding	12- 3	78
"Dipper" to Dredge Louisiana Canals	12- 3	82
Let's Look at Offshore Mobile Units—R. J. Howe and B. G. Collipp	12- 3	91
Drilling Tender Is Maracaibo Bound	12-10	97
New Tool for Mapping Offshore	12-10	97
Weight Coating Applied by Extrusion—Larry Resen	12-10	114
R. & B. Below 19,000 in Stepout from Deepest Hole	12-17	92
Gus II Is Most Powerful Rig Afloat	12-17	104
Something New in a Submersible Barge—Ed McGhee	12-24	58
World's Biggest and Newest Submersible Barge Sports Split Hull	12-31	90
Shell de Venezuela's Score in Lake Maracaibo Operations: Over 100 Wells, 140,000+ Bbl. Per Day	12-31	166
New Aramco Pipeline Will Put Biggest Offshore Field in Business	12-31	182

1957

	Date	Page
LeTourneau Now Building a Rig to Lower Offshore Costs	1-14	75
California Attorney Appeals Tidelands Case	1-14	79
Delta Offshore Drives A.C., D.C. Generators Together—Ed McGhee	1-14	122
A Look at Submarine Pipelining—Claude F. Horton	1-21	104

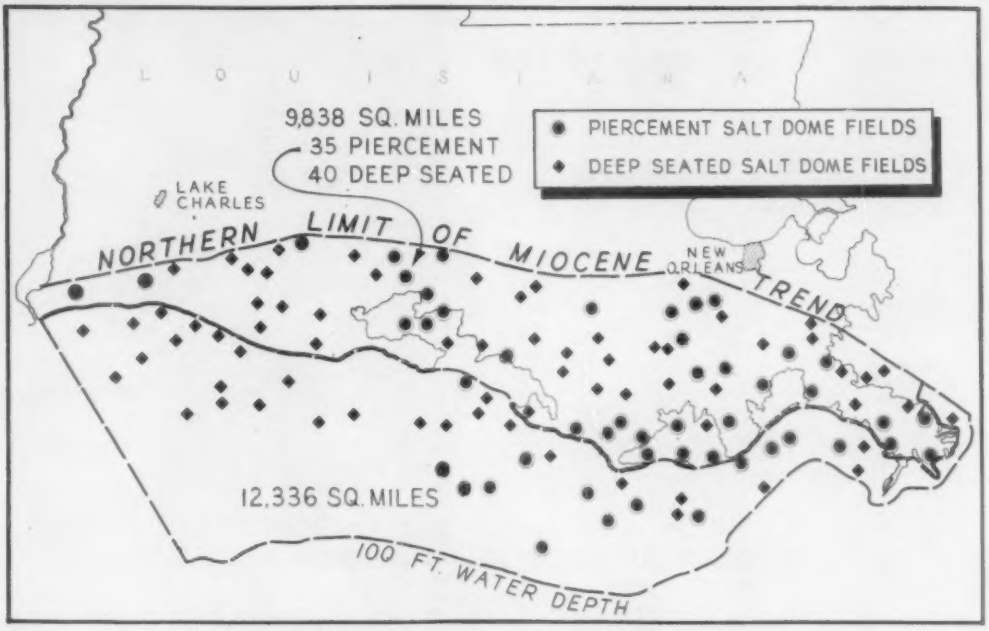


Fig. 1—There is a marked similarity in geologic conditions between onshore Louisiana and offshore Louisiana. Comparison of the two areas indicates the offshore reserves will be on the order of 4.6 billion barrels of oil.

LOUISIANA OFFSHORE . . .

Its promise is bright—its risks are for the daring

by Gordon I. Atwater

THE Continental Shelf of the Gulf of Mexico constitutes America's newest oil province because of its geographic position and the special operating conditions that prevail in the area. It has already become a major oil-and-gas-producing area at this early stage in its development. The most important part of this new oil province is now established as those water bottoms lying offshore of southern Louisiana, and it is in this area that current leasing and drilling activity are greatest.

Regional setting . . . Carsey (1950) described in detail the geography and geology of the Continental Shelf. In brief summary, the Louisiana offshore oil province is a continuation of the prolific Miocene producing trend which lies at the north under the marshlands of southern Louisiana. The sequence of undifferentiated sands and shales constituting the Miocene strata dips rather gently gulfward. The entire Miocene section, as penetrated to date, thickens appreciably seaward. In the southern parts of the offshore area, a well-developed section of Pliocene age overlies the Miocene strata, and is oil-and-gas-productive in some fields. These Pliocene beds, however, are not lithologically distinguishable from the underlying Miocene sediments; therefore, the Miocene-Pliocene sequence is normally undifferentiated.

The deepest well in the Louisiana Miocene trend, which is currently the deepest producing well in the world, reached the total depth of 22,570 ft. without having penetrated the complete Miocene section. Wells drilled offshore to depths of more than 15,000 ft. also fail to penetrate the complete Miocene section. Many stop before reaching the lower Miocene. Various estimates have been made of the maximum thickness of this sequence, but a thickness of 25,000-30,000 ft. for the Miocene-Pliocene section is considered conservative.

The normal southward regional dip of these beds is interrupted by domal uplifts caused by piercement-type salt domes and deep-seated structures, which are also of salt-dome origin. These domal uplifts form the structural traps for the major oil and gas fields found in the area.

Because of the fortunate similarity in geological conditions between the offshore water bottoms and the adjacent marshland areas, it is possible to make,

The author is consulting geologist, New Orleans. Paper appears in the Bulletin of the American Association of Petroleum Geologists, November 1956, pp. 2624-35.

THE AUTHOR SAYS

- Initial exploration and development work in the Gulf of Mexico will be confined to Grade A prospects.
- Offshore in the area of study, there are 95 Grade A prospects, and many of these have not been tested.
- Offshore fields to be commercial must have reserves of at least 20 million barrels of oil or its equivalent.
- Onshore oil reserves average 500,000 bbl. per well; this figure includes dry holes, but does not include gas reserves.
- Wells located on deep-seated structures average 1.1 million barrels of reserves, converting gas reserves to oil.
- And wells located on piercement domes average only 600,000 bbl. of reserves when converting gas to oil reserves.
- Onshore gas reserves are largely confined to deep-seated structures.

●

. . . AND PREDICTS

- 71 fields, each with at least 20 million barrels of reserves, will be found among the 95 Grade A offshore structures analyzed.
- 1 out of every 4 of the Grade A prospects offshore will be non-commercial.
- 18 out of the 71 commercial offshore fields should become "giant" fields with at least 100 million barrels of reserves or its equivalent.
- At least 2,400 wells will be needed to explore and develop the 71 commercial offshore fields.
- Oil and gas reserves on the 71 offshore commercial fields will be 4.6 billion barrels.

on the basis of the number and extent of the known commercial oil and gas fields in the already developed land areas, reasonable predictions of the success probability on undeveloped structures offshore. However, the companies in their exploration of the virgin marine areas have, so far, searched for and leased only the larger structural features, commonly referred to as grade "A" prospects. The initial exploration and development program will essentially be restricted to this type of structure.

A detailed analysis of all of the major structural features found in the Miocene trend of Louisiana has been made in order to provide a basis for predicting the reserves of similar prospects and fields that have been found and will be found in the offshore area. This selection of the major features eliminates less prominent structures, many of which account for major reserves in southern Louisiana; exploration and development of these less prominent features will constitute a later phase of development of the Louisiana Continental Shelf.

It should be emphasized that this paper deals only with the major structural features. The second generation of offshore exploration will be concerned with the development of low-relief structural complexes and interdomal features; this phase will probably develop reserves comparable with those located on the major structures. Oil companies, however, in undertaking the exploration of these low-relief features at a later date, will be faced with a much higher rate of dry-hole incidence prior to discovery of commercial fields than will prevail during the current exploration of the major structural features.

Geographic Distribution

As shown in Fig. 1, the onshore area studies is restricted by the inclusion of only those fields of southern Louisiana where the reserves are found substantially in the Miocene section. This classification eliminates such major onshore fields as Delta Farms and Romere Pass, where large reserves are present on interdomal, low-relief features. The locations are shown for all of the major onshore features, those that would be classified in offshore exploration as prominent and grade "A." The piercement salt-dome fields are designated by circles; the deep-seated salt-dome fields are designated by diamonds.

The only offshore features shown are those on which production had been established prior to 1956. The offshore area for which forecasts are made has been restricted to that part of the Continental Shelf which lies between the shore line and the 100-ft.-depth line, because present equipment and techniques have generally restricted operations to within that depth. It is not anticipated that extensive operations will be undertaken in much deeper waters within the near future.

The frequency of occurrence of the 75 onshore major structures is equal to one structure for each 131 sq. miles. Within the water area studied there are approximately 95 major structures. Many of these have not yet been tested and are not shown in Fig. 1, equal to a frequency of occurrence of one structure for each 130 sq. miles.

Of the onshore structures, 47 per cent are shallow piercement salt domes, and 53 per cent are deep-seated features. Based on admittedly less-positive geophysical

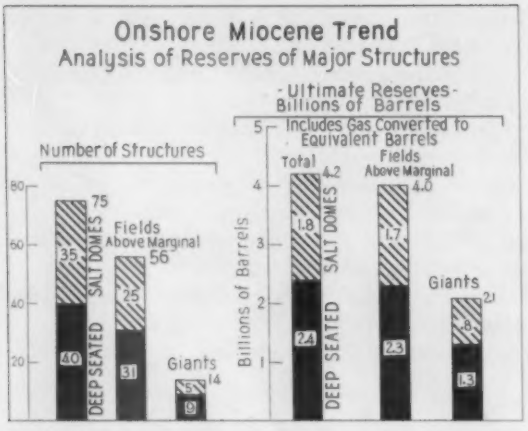


Fig. 2—By offshore standards, 25 per cent of the onshore oil or gas-condensate fields are noncommercial. The commercial onshore fields have reserves of 4 billion barrels.

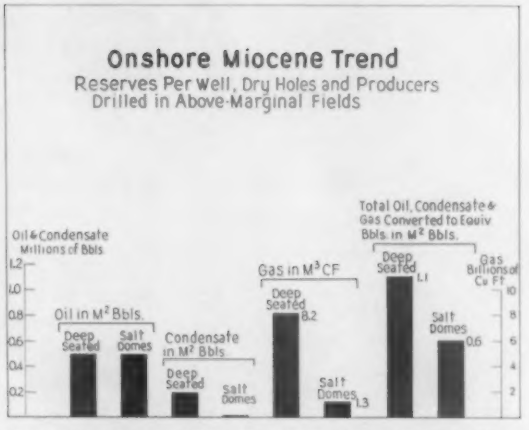

Onshore Miocene Trend
Reserves Per Well, Dry Holes and Producers
Drilled in Above-Marginal Fields
Oil & Condensate Millions of Bbls.
Oil in M³ Bbls.
Condensate in M³ Bbls.
Gas in M³ CF
Total Oil, Condensate & Gas Converted to Equiv Bbls. in M³ Bbls.
Gas Billions of Cu Ft
Deep Seated
Salt Domes

Fig. 3—The average field well on both deep-seated and piercement domes has reserves of 500,000 bbl.; this average figure includes dry holes. But when gas reserves are converted to oil, the deep-seated fields average 1.1 million barrels per well.

evidence, there is reason to believe that 45 per cent of the 95 offshore structures are piercement, and 55 per cent are deep-seated.

The similarity between the onshore and offshore areas is sharply emphasized by the constancy of frequency of occurrence and distribution of structural types.

Analysis of Reserves of Major Structures Onshore Miocene Trend (Fig. 2)

The assumption has been made that 20 million barrels of oil or its equivalent gas and condensate reserves is necessary to provide a margin of profit for the offshore operator. Gas, for the purpose of this study, has been converted into barrels of oil on an economic basis, using a price of 15 cents per M.c.f. for gas and $3 per barrel for oil and condensate. These figures have no relationship to value in the ground or net profit to be anticipated by the operator. A trillion cubic feet of gas reserve, not counting the associated condensate, would be equal to a 50-million-barrel oil field.

Of the 75 major onshore structures, only 56, or 75 per cent, have enough proved ultimate reserves at the present time to be commercial if they were to be developed under offshore conditions. According to offshore standards, 25 per cent (one out of four) of the major onshore structures would be submarginal. Of the 56 fields meeting the above-marginal requirements, 25 are piercement salt domes and 31 are deep-seated. These relationships are shown in Fig. 2.

Of the 56 above-marginal fields, 14, or 25 per cent (one out of four) are giants, defined as containing proved ultimate reserves in excess of 100 million barrels of oil or its equivalent, or both. Deep-seated structures account for 9 of these 14 giant fields; piercement salt domes account for only five. The chance of finding a giant field in drilling any one of the 75 structures would be one out of five.

The proved ultimate reserves of the 75 structures are equivalent of 4.2 billion barrels of oil. Deep-seated features account for 2.4 billion barrels of this reserve, and 1.8 billion barrels is found on salt domes.

Analyses of the 56 fields with the above-marginal reserves show that these fields have 4 billion barrels of reserves, and the 19 submarginal fields, representing 25 per cent of the total structures, account for only 200 million barrels of the recoverable reserves.

The 14 giants have reserves of 2.1 billion barrels, which exceeds 50 per cent of the total reserves of the entire 56 above-marginal fields.

Because of the geologically similar nature of the offshore province, there is good reason to believe that similar ratios will develop as the offshore area is explored. It must be remembered, however, that the onshore reserves assigned the structures studied represent only the proved recoverable reserves now established. In numerous places, substantial additional reserves for the onshore fields still await the drill. And these comparative figures, therefore, represent a floor or minimum estimate of the ultimate reserves to be anticipated.

The establishment of relatively minor new reserves could bring many submarginal fields into the commercially profitable offshore group, or add a new giant field to the select class.

Reserves per Well, Dry Holes and Producers, Drilled in Above-Marginal Fields Onshore Miocene Trend (Fig. 3)

An analysis of the reserves per well in the onshore fields having reserves of more than the marginal 20 million barrels, including dry holes, shows that insofar as oil is concerned both the deep-seated and salt-dome structures average 500,000 bbl. per well.

It is interesting to note, however, that the gas reserves of the deep-seated features are equal to 82,000 M.M.c.f. per well for the deep-seated structures, and only 13,000 M.M.c.f. for the salt-dome well. The condensate reserves show a proportionate disparity, with 200,000 bbl. per well for the deep-seated structures, and only a negligible amount for the salt domes.

Expressed entirely in terms of barrels of oil, the wells located on the deep-seated features average 1.1 million barrels per well, including dry holes, almost twice the 600,000 bbl. of reserves attributable to the salt-dome-structure well. This disparity has an important bearing on the profit to be anticipated in development of the deep-seated features, and this disparity reflects the fact that fewer wells are required

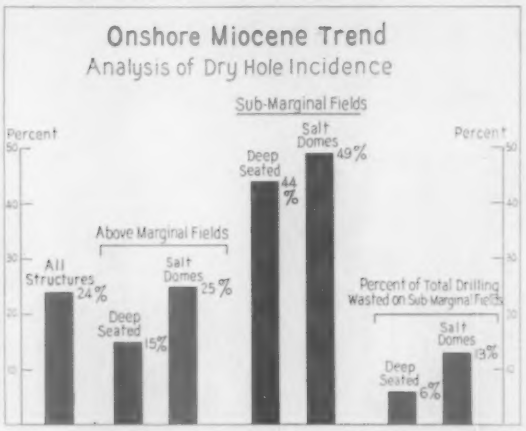


Fig. 4—For all onshore structures, the dry-hole incidence is 24 per cent. Notice, however, that deep-seated structures are much easier to condemn by drilling than the shallow salt domes.

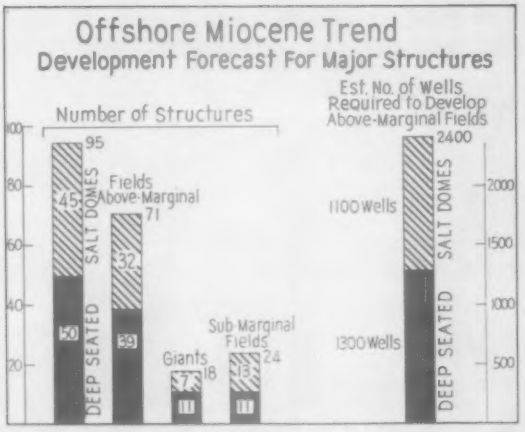


Fig. 5—Statistics show that one out of every four offshore structures will probably be noncommercial. It will require 2,400 wells to develop the commercial structures.

to produce the gas and condensate reserves from the generally less-complex deep-seated structures. In addition, a lower dry-hole incidence attends the development of the deep-seated features.

In other words, reservewise, there is a direct expression of the economic fact that per dollar invested, more money can be made by the operation of gas fields than oil fields.

One of the most interesting results of the study has been the development of the fact that the gas reserves of the Miocene in Louisiana are almost entirely confined to the deep-seated features. On the other hand, the distribution of oil is relatively uniform between deep-seated features and piercement salt domes. The reason for this selective occurrence of gas finds no ready and positive answer, but the problem deserves additional consideration.

It should be pointed out that, in order to get a true picture of the reserves per well for the onshore fields, it has been necessary to omit from the analysis four fields, two of each type of structure, where restricted drilling or early shallow drilling completely distorted the relationship that would prevail under present-day conditions.

Analysis of Dry-Hole Incidence Onshore Miocene Trend (Fig. 4)

An analysis of the incidence of occurrence of dry holes in the onshore Miocene fields shows that for all structures, both above-marginal and submarginal, 24 per cent of the wells drilled were abandoned as dry.

For the above-marginal fields, 15 per cent of the wells drilled on the deep-seated structures failed to establish production; and 25 per cent of the wells drilled on the piercement salt-dome structures were dry.

For the submarginal fields, the dry-hole incidence for the deep-seated structures was 44 per cent and for the salt-dome structures 49 per cent.

In terms of the amount of total drilling on the 75 major structures, 6 per cent of the drilling was wasted on submarginal deep-seated features, and 13 per cent of the total drilling occurred on submarginal salt-dome structures. This reflects the relative ease with which a deep-seated feature can be condemned, as opposed to the difficulty of condemning the more complex salt-dome structure.

Translating these figures to offshore conditions presents several problems involving conflicting trends. Competitive lease situations on land have undoubtedly caused the drilling of both unnecessary producers and dry holes. Offshore development, in general, will probably settle down to wider spacing than has prevailed on land, with resultant fewer producers in proved fault segments. However, offshore operators will not drill as many semi-exploratory wells on the margins of the structures, with accompanying high dry-hole incidence, as have been drilled on land, where royalty offset obligations prevail.

In spite of the essential differences between water and land operations, the success ratios between deep-seated and salt-dome structures for land operations should be valid for offshore development.

Development Forecast for Major Structures Offshore Miocene Trend (Fig. 5)

On the basis of the analysis of the geologically similar onshore province, it is predicted that 71 above-marginal fields will be found among the 95 major offshore structures in water depths of less than 100 ft. One out of every four offshore major features will probably be noncommercial upon development; and this does not consider the large geophysical, leasing, and initial exploration expenses that can easily amount to 5 to 10 million dollars for each structure.

Unfortunately, the oil companies will spend as many millions of dollars proving a structure noncommercial as they will in establishing profitable production in the above-marginal fields.

Of the 71 above-marginal fields, approximately 39 should be deep-seated features, and 32 should be piercement salt domes. Noncommercial reserves will be found on 24 of the total of 95 structures. Of the 71 commercial fields, 18 should be giants; 7 of these should be salt-domes and 11 deep-seated.

With due allowance for the fewer wells that will be required to develop offshore fields, where the operator has no drainage problems and no downdip landowners to protect and where modern techniques of dual completions are now standard practice, the esti-

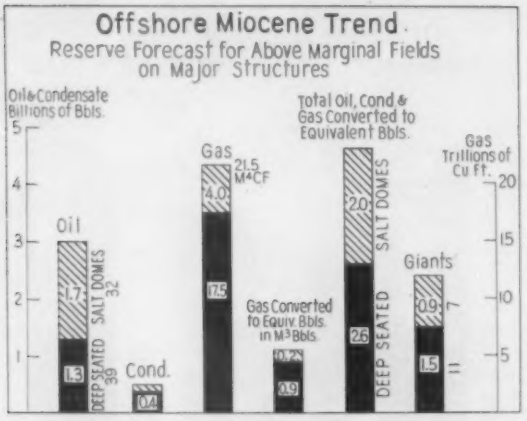


Fig. 6—The offshore giant fields, i.e. those with at least 100 million barrels of reserves, will harbor over 50 per cent of the offshore oil and gas.

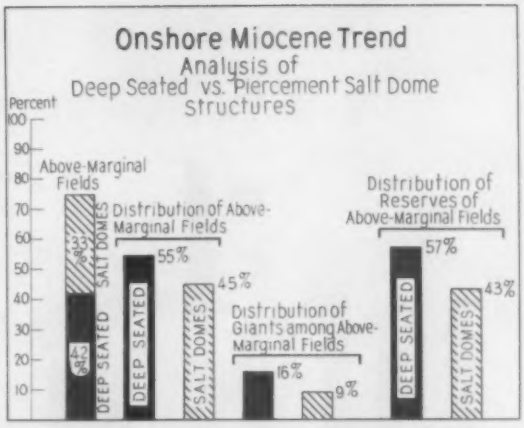


Fig. 7—Deep-seated structures offer the best chance for success both in terms of drilling and of reserves.

mated number of wells required to develop the predicted 71 commercial fields is 2,400. This is based on an anticipated average recovery per well, including dry holes, of 2,000,000 bbl. of oil or its equivalent, or both, for the deep-seated features, and 1,800,000 bbl. per well for the piercement salt domes.

Reserve Forecast for Above-Marginal Fields on Major Structures Offshore Miocene Trend (Fig. 6)

In forecasting the recoverable reserves of the offshore structures, a reduction factor of 10 per cent has been applied against onshore reserves because offshore operators will be forced by economics to skim the cream from the field reserves. High operational costs will not allow the operator either to produce the wells to the economic limit of onshore operations or to drill for and complete in thin sands or minor fault blocks.

Based on the ultimate recoverable reserves of the onshore counterpart fields, 3 billion barrels of oil can be anticipated from the 71 major offshore commercial structures. The salt domes should account for 1.7 billion barrels of this total.

The anticipated gas reserves of the major structures in the offshore province are estimated to be 21.5 trillion cubic feet, of which 17.5 trillion will be associated with deep-seated features. This reserve of 21.5 trillion cubic feet of gas represents the equivalent of 1.1 billion barrels of oil.

The total reserves, expressed in terms of barrels of oil, for the major structures of the offshore province are estimated to be 4.6 billion barrels, of which 2.6 billion will be found associated with the deep-seated features.

The 18 giant fields should account for 2.4 billion barrels, or more than 50 per cent of the total reserves.

Analysis of Deep-Seated Versus Piercement Salt-Dome Structures Onshore Miocene Trend (Fig. 7)

From the foregoing analyses, it appears that the operators who concentrate their efforts on the deep-seated features are playing the game with the least odds loaded against them. However, an offshore producing field on a piercement salt-dome structure has already promised to surpass all onshore Miocene fields in terms of reserve barrels of oil. The well-established trend shown in the onshore Miocene area appears too pronounced to anticipate its general reversal in offshore development. Comment has already been made on the increased per well recoveries and lower development costs attendant with the development of the deep-seated structures.

An analysis of the relationships between the onshore deep-seated and the piercement-type salt-dome structures shows that out of the total number of offshore major structures to be attacked by the drill, 42 per cent should develop into above-marginal fields of the deep-seated class, and only 33 per cent of those structures probably will be above-marginal fields associated with piercement salt domes.

Within the classification of the above-marginal fields, 55 per cent of these structures will be deep-seated and 45 per cent will be piercement salt domes.

Of the total number of commercial fields to be encountered offshore, 16 per cent should be oil and gas fields of the giant class on deep-seated structures, and only 9 per cent will be giants associated with piercement salt domes.

Of the total reserves to be found offshore, 57 per cent should be found on deep-seated features and 43 per cent on piercement-type salt domes.

Relationships of Reserve Distribution and Dry-Hole Incidence Onshore Miocene Trend (Fig. 8)

A percentage distribution plot of the fields located on major structures in the onshore Miocene trend, classified by the amount of ultimate reserves, shows a reasonably regular curve, with the greatest number of structures containing the smallest amount of reserves per structure.

The first group, representing structures or fields containing less than 20-million-barrel reserve, considered submarginal for offshore operations, has the highest dry-hole incidence.

As the fields increase in size reservewise, the curve showing the recoverable reserves per well in general rises, while the curve representing the dry-hole incidence drops. Minor variations from the general trends are almost certainly caused by sampling errors.

It appears that operators would be well advised to watch the dry-hole incidence during early stages of development of offshore fields. If the dry-hole or submarginal-well incidence appears to be taking a

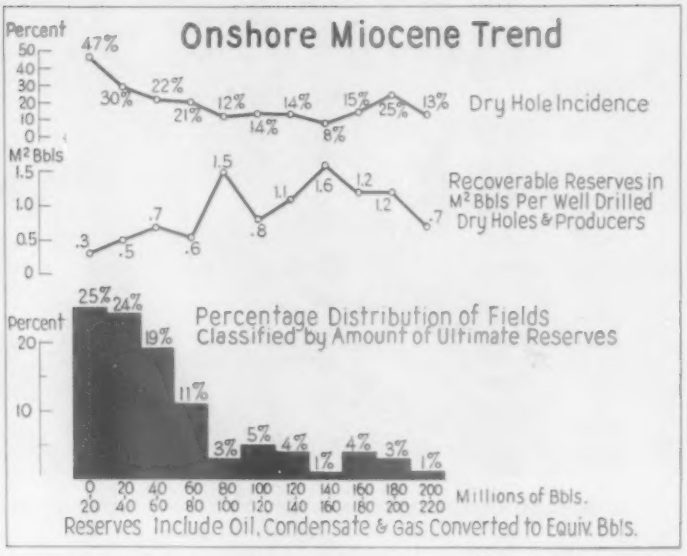


Fig. 8—Onshore fields show a high incidence of dry holes on noncommercial fields. This could be used as a guide to determine the value of a partially developed offshore field. If the dry-hole incidence is high, the field is probably noncommercial.

". . . operators who concentrate their efforts on the deep-seated features are playing the game with the least odds loaded against them. However, an offshore producing field on a piercement salt-dome structure has already promised to surpass all onshore Miocene fields in terms of reserve barrels of oil . . . Of the total reserves to be found offshore, 57 per cent should be found on deep-seated features . . ."

trend in excess of 25 per cent, it would be well to recognize that a warning flag has been hoisted.

Attention should be called to the fact that both geologists and production engineers are prone to complete, as successful producers, offshore wells that give little indication of the presence of commercially satisfactory reserves. This is done too often in an attempt to satisfy management that the well should have been drilled in the first place. While this practice has been justifiably used for purposes of holding a lease by production, continuance is apt to lead only to substantial expenditures for development of one of the submarginal structures. The geologists and production men should be constantly conscious that all indications point to the fact that one of every four offshore structures may be noncommercial, in spite of its size and amount of uplift.

The ability to solve the problem of when to stop development of a noncommercial structure may well represent the margin of profit to be expected in offshore operations.

Conclusions

It appears possible to predict the minimum recoverable reserves that will be found in the Louisiana offshore oil province by analogy with its onshore geological counterpart. Although the present study is restricted to the major structural features that are receiving attention during the initial phase of exploration, expansion of this study could be made to encompass total ultimate recoverable reserves for the entire area.

The distribution of reserves of both oil and gas between the two basic structural types, and the dry-hole incidence attendant with development, suggest that the deep-seated offshore features present a more attractive economic climate than do the piercement salt domes.

References

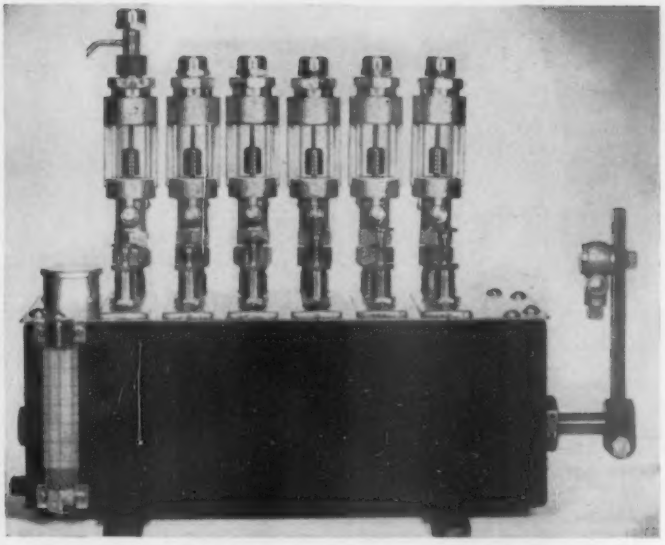
Carsey, J. B., 1950, "Geology of Gulf Coastal Area and Continental Shelf," Bull. A.A.P.G., Vol. 34, pp. 361-85.

Here's the Journal's estimate of cumulative production and proved reserves on offshore Louisiana*

(Figures in thousands of barrels)

	Cum. prod.	Est. res.	No. wells
Bay Marchand	17,189	67,811	87
Belle Isle	3,042	17,958	21
Breton Sound:			
Blk. 20	1,349	8,651	10
Eugene Island:			
Blk. 18 and 32	5,007	19,993	25
Blk. 126	7,382	49,618	52
Blk. 128	466	8,534	9
Grand Isle:			
Blk. 18	5,409	20,591	26
Main Pass:			
Blk. 35	13,296	76,704	74
Blk. 69*	16,666	102,334	93
Ship Shoal:			
Blk. 154	460	14,540	15
South Pass:			
Blk. 24*	33,489	378,511	312
Blk. 27	2,292	25,708	28
West Delta:			
Blk. 30	1,640	33,360	35
Blk. 53	1,759	9,241	11

*Fields producing 1,000 bbl. per day or more.



Mechanical bobbers aid sight-feed lubrication.
Fig. 1.

10 things Humble learned from its

Gas-Engine, Gas-Plant Lube Program

by Edward D. Shannon
Humble Oil & Refining Co.

THE results of a gas-engine-test and gas-plant-lubrication program developed by Humble Oil & Refining Co. may be summarized as follows:

1. A premium detergent naphthenic oil has been found desirable for two-cycle and four-cycle gas-engine service.
2. Cotton waste or cellulose-fiber filter elements are best suited for use with detergent oils.
3. Sight-feed mechanical bobbers or the new vacuum type of lubricators should be used with detergent oils.
4. Drain periods of gear box oils should be watched closely with a 6-month maximum interval desirable under normal operating conditions.
5. Lead-soap extreme-pressure gear oils are best suited for industrial application.
6. Avoid overlubrication of electric motors and consider a high-grade industrial multipurpose grease for best over-all results.
7. Avoid compounded steam cylinder oils when the exhaust steam is to be reused.
8. Observe air-compressor crankcase-drain intervals closely and always use a premium-grade lubricant for cylinder lubrication.
9. The crankcase oil for the auxiliary engines can usually be the same as the gas-engine oil.
10. In pump lubrication use a premium industrial multipurpose grease or a premium-grade rust and oxidation-inhibited oil.

Gas Engines

For many years Humble has continually conducted test programs to determine the best type and quality of oil required for gas-plant equipment. In order to take care of the newer, increased-horsepower gas engines these test programs were expanded to determine the utility of existing oils and to develop new oils where necessary. At the present time 14 different oils have been investigated in gas-engine tests accumulating a total of approximately 1 million operating hours.

Gas-Engine-Lubricant Tests

Several general conclusions have been made from past experience and the test program involving both two-cycle and four-cycle gas engines.

1. **The low wear rates** experienced with all of the oils tested indicates several years' operation is possible without overhaul. Engine cleanliness, as it concerns port plugging, ring sticking, retarded heat transfer, etc., is a more serious problem than wear.

2. **In two-cycle engines,** port plugging and ring sticking are the principal problems, and these conditions are aggravated by excessive lubrication and appear to be affected by engine and ring design. Crankcase-oil requirements are not critical, but for power-cylinder lubrication, naphthenic-base oils are superior to paraffinic-base oils.

3. **In four-cycle gas engines,** sludging of the crankcase, filter plugging, and ring-zone cleanliness have been the primary problems. The application of detergent oils has proven highly beneficial in the solution of these problems.

Detergent naphthenic oil . . . The test program involving the detergent naphthenic oil has shown superior crankcase cleanliness in comparison with straight paraffinic oils. At the same time, better oil-ring condition and upper-ring-zone-area cleanliness have been obtained. The piston underhead area has been found to be relatively free of deposits, thus insuring better heat transfer in this area.

In two-cycle gas engines the detergent naphthenic oil has been proven satisfactory in all respects. In some two-cycle gas engines this oil has been helpful in reducing ring sticking. Although the detergent naphthenic oil is of help in this respect, it cannot be expected completely to eliminate the problem. The detergent naphthenic oil

This gear box went undrained too long . . . while this motor was overlubricated.

Fig. 2. Fig. 3.

has proven equal to the straight naphthenic oil with respect to minimizing port plugging.

The data collected to the present time indicate that a properly selected naphthenic-base oil combined with the proper level of compatible and effective detergent additives is best suited for gas-engine lubrication. In this respect, the many benefits of one oil for both types of gas engines may be realized.

Selection of Filter Media

When detergent oils are used, the type of filter that is employed is important. There are two types of filter media in common use today. One is activated fuller's earth, and the other is cotton waste or cellulose fiber. Since activated fuller's earth will remove both soluble and insoluble matter from the oil, it should not be used on engines operating on detergent oils. The activated fuller's earth will remove the detergent additive to a point where the detergent level can be reduced to 20 per cent of its original value. Consequently, where detergent oils are used, the filter media should be either cotton waste or cellulose fiber.

Sight-Feed Fouling

It is always desirable to use the same oil for power-cylinder and compressor-cylinder lubrication as that employed in the crankcase. The method of lubrication, for the cylinders, is the force-feed lubricator. The reaction of detergents and other additives in heavy-duty lubricating oils with sight-feed lubricator fluid is recognized as unavoidable. The installation of mechanical bobbers has proven an economical solution to this problem. Fig. 1 shows a mechanical lubricator with the mechanical bobbers installed in the sight-glass assemblies.

Recent developments have introduced the vacuum-type sight-feed lubricator which completely eliminates any necessity for a fluid. Our experience with this new lubricator is limited, but reports indicate it may be helpful in the solution of the problem of sight-glass fouling.

Viscosity Increase

An operating problem that has been encountered with four-cycle gas engines is viscosity increase of the crankcase oil. This problem appears to be affected by the installation of conformable-type oil rings. These new rings do such a fine job of controlling oil consumption that there is very little crankcase makeup required. With this low requirement of makeup oil, oxidation is a more serious problem and results in oil viscosity increase sometimes amounting to 50 per cent of the original value.

One suggested solution to this problem is to pull oil from the crankcase for compressor cylinder lubrication. In this manner, more makeup oil will be used in the crankcase, and the original viscosity level of the oil will be better maintained.

In two-cylinder operation, perhaps the most important problem is port plugging. Our tests have conclusively proven that naphthenic oils are superior to paraffinic oils in this instance. However, power-cylinder feed rate is also important. This is not a case where if a little is good, more should be better. Good cylinder lubrication can be accomplished with only the necessary amount of oil required for optimum performance. It is our opinion, based on our evaluation program, that feed rates in the order of 6,000 hp. hours per gallon are desirable. Experience in each individual case, pertaining to the engine and the service, best dictates how far you should vary from this figure. This figure is offered as a guide for consideration.

Crankcase-Oil Replacement

Consideration of the frequency of crankcase-oil replacement is one of many and varied opinions. In two-cycle gas engines, drain periods of several years are not uncommon. The severity of service is slight and semi-annual used-oil test analyses can normally be relied upon to guide you in your decision as to when the oil has reached the end of its useful life.

Four-cycle gas engines . . . Here, service is much more severe. Crankcase oil deteriorates and is contaminated at a faster rate, and crankcase changes are necessary at more frequent intervals.

To say the efforts of the filter manufacturers have been successful in prolonging the crankcase drain intervals in these engines would be a gross understatement. They have done much to maintain acceptable oil condition over increasing hours of service.

But it would also be fair and logical to say that there is no substitute for fresh oil if new-oil benefits are to be fully realized. The many advantages of good oil in prolonging overhaul

periods and retaining maximum engine efficiency have long been recognized. This is particularly true in obtaining the maximum benefits of detergent oils and certainly applies to straight mineral oils as well.

Gas-engine test program . . . This has been operating the larger four-cylinder gas engines on an 8,000-hour drain interval and 750-hour filter changes. Because it is felt that the best possible oil condition would result in better operation, the economics that would be involved in shorter drain periods and less frequent filter changes has been investigated.

Some cost figures . . . As a base case, the test-program practice has been designated as Case A. Based on the current price structure for the detergent naphthenic oil being used in the engines, and a six-element waste pack, partial-flow filter, the following data were developed on the basis of a four-cycle gas engine operating 24 hours a day for 1 year. The cost figures thus developed are effective for 1-year operation under the oil-drain and filter-change practices indicated. Of course, the annual cost would be perpetuating and merely serves as an economic comparison of the three proposals.

CASE A
8,000-Hour Crankcase Drain, 750-Hour Filter Change

Oil consumed:	
Crankcase	250 gal.
Filter changes	400 gal.
Total	650 gal.
Filter costs	$375.00
Oil costs	227.50
Total annual cost	$602.50

Recent tests in our refinery were conducted on engines engaged in severe service. In an effort to prolong the service life of the engine it was decided to go to the extreme on crankcase-drain intervals. The crankcase was changed every 2,000 hours at which time the filter was changed. After a year's operation, inspection of the engine showed it to be in the best condition ever witnessed. Although it may seem extreme, it seemed worthy of consideration in this study.

CASE B
2,000-Hour Crankcase Drain, 2,000-Hour Filter Change

Oil consumed:	
Crankcase	1,000 gal.
Filter changes	160 gal.
Total	1,160 gal.
Filter costs	$150.00
Oil costs	406.00
Total annual cost:	
Case B	$556.00
Case A	602.50

As a compromise, it is felt that Case C might be a more practical plan. Even though there is little doubt that Case B would give better engine cleanliness and consequently superior engine performance than Case A, down time for crankcase changes might be uneconomical, particularly where a plant was operating close to capacity. Consequently, the following plan was devised as one offering maximum benefits from considerations of both engine condition and down time due to crankcase changes.

CASE C
4,500-Hour Crankcase Drain, 1,500-Hour Filter Change

Oil consumed:	
Crankcase	500 gal.
Filter changes	240 gal.
Total	740 gal.
Filter costs	$225.00
Oil costs	259.00
Total annual cost:	
Case C	$484.00
Case B	556.00
Case A	602.50

These three plans are ones now being studied. They are by no means the end result or the final analysis. But it is strongly felt that more frequent chankcase-oil changes will result in better over-all engine performance and they certainly are worth consideration. These three plans are offered for study and examination. Even though Case A has given good operation, it can be seen that economical Case C is of advantage, and it is felt that Case C will offer operational advantages.

Lubrication of Gear Boxes

Fig. 2 is an example of what can happen in a gear box. Such a condition is usually experienced with excessive gear-unit drain intervals. Mistakenly, some people associate oil deterioration only with internal-combustion engines. As you can see, this is not always the case.

To obtain suitable service life from a gear unit, oil that is clean and free from sludge and contaminants at all times, is a necessity. To make this possible, regular drain intervals should be established. These intervals will vary with the degree of temperature change and the general condition of the atmosphere, such as dust, moisture, and other foreign contaminants.

For a new unit, the oil should be drained at the end of the first 2 weeks' operation. The case should then be flushed with a flushing oil, preferably of the same base stock as the service oil, and then refilled with the recommended lubricant. Following this procedure, the oil should be drained every 2,500 hours or 6 months. If extreme temperature variations are encountered, this interval should be reduced to 3 months to prevent excessive accumulation of moisture. If the atmosphere is unusually dusty or if corrosive gases are present, the shorter drain interval should also be observed.

Care should be taken to be certain that the correct level of lubricant is maintained in the gear case. Excessive levels can be responsible for overheating and resultant shorter oil and unit life.

Extreme Pressure Gear Lubricants

In many instances, particularly on cooling-tower and fin-fan cooler installations, the use of an extreme-pressure oil is advisable. The units are sometimes subjected to shock loading as a result of the intermittent gusts of wind that throw excess load on the unit. It is strongly felt that the use of extreme-pressure oils for this application is worth the additional cost over a straight mineral oil.

Type of additive . . . When selecting an extreme-pressure oil for such an application, close attention should be given to the type of extreme-pressure additive that is incorporated in the oil. For many years sulfur and chlorine have been the most popular of the extreme-pressure additives. However, in order to be certain that no ill effects toward any brass or bronze components of a gear case are realized, the use of lead-soap additives is advisable. In addition to the presence of such a noncorrosive additive, good oxidation resistance and water separation are beneficial. Many of the gear manufacturers are recognizing the advantages of such oils and specifying them in their lubrication - instruction sheets.

Electric-Motor Lubrication

Today, most of the electric motors being manufactured are equipped with antifriction bearings that are grease lubricated. Many of these motors, and certainly most of the older models, are equipped with grease fittings that are to be serviced at regular intervals. Perhaps one of the most common errors in lubricating electric motors is overlubrication. Fig. 3 is an example of the results of overlubrication of an electric motor. The grease seals are ruptured and, as would be expected, the excess grease had fouled the armature. This condition is often brought about because excessive grease will cause the bearing to overheat. As the most generally accepted cause for overheating is underlubrication, the operator may force more grease into the bearing, thus aggravating the condition.

Motor-lubrication intervals . . . Under normal operating conditions, where the motor is rated in excess of 10 hp. and is not subjected to extreme heat, it should be greased only once a year. Where the motor is carrying a high load and is subjected to temperatures above 100° F., it should be greased every 6 months.

For motors operating at 1,800 r.p.m. or higher and under normal operating conditions, the lubrication interval should be every 6 months. If the motor is subjected to severe conditions, such as high temperature and service 24 hours a day, it should be lubricated every 3 months.

When lubricating an electric motor, be certain that the grease relief plug is free of old grease, making it possible to purge the bearing.

Industrial Multipurpose Grease

For many years a premium-grade, soda-base grease was considered the ideal product to use in lubricating an electric motor. Such a product has served admirably for this application. However, it is becoming more important each year that the number of greases required for the proper lubrication of a plant be held to a minimum. Consequently, much research has been directed toward the development of a "multipurpose" grease that would serve as well in antifriction bearings, high temperatures, and wet conditions as the three greases that have been required for such applications in the past.

One grease . . . An industrial multipurpose grease that has been proved in electric-motor lubrication, pump and plain-bearing lubrication with equal success is now being recommended to the gas plant industry. This type of product is characterized by excellent heat resistance, water resistance, and oxidation resistance. This means that only one grease is required whenever a grease fitting is encountered. Application of the wrong grease and excessive stock problems can now be a thing of the past. In addition, the cost of a multipurpose grease is no greater than the average cost of the several greases previously required for good plant lubrication.

Lubrication of Reciprocating Steam Equipment

The selection of the lubricant required for reciprocating steam equipment in gas plants is based primarily on one factor. Is the exhaust steam used for boiler feed or process heating? If it is not, a compounded steam cylinder oil is the correct product. Some moisture is always present in the cylinder unless you are using superheated steam. Current lubrication is maintained, despite this moisture which washes the lubrication film from the cylinder walls, by compounding cylinder oils with a relatively small percentage of emulsifying additives. The compounded oil then emulsifies readily with water and remains on the cylinder walls.

Condensate . . . However, where the exhaust steam is condensed for boiler feed, or employed for process heating, the oil must separate readily from the water. In these particular applications, a noncompounded highly refined straight mineral cylinder oil is most desirable. This same type of lubricant may also be used for cylinders operating on superheated steam where there is little or not moisture present.

If the compounded oils are used in cases where the exhaust steam is condensed and used as boiler feed for process heating, there can be an accumulation of deposits on the boiler tubes or in the process heating equipment that can eventually require a shutdown for thorough cleaning. Oddly enough, there have been many instances in the industry where this misapplication of lubricants has been encountered.

Miscellaneous Gas-Plant Equipment

The lubrication of miscellaneous equipment can be a very important part of adequate gas-plant lubrication. Such equipment as air compressors, auxiliary engines, and rotary or reciprpcating pumps would fail in this category.

Air compressor lubrication . . . In the lubrication of air compressors, the parts lubricated are the cylinders, bearings, and guides. Lubricant selection is dictated by the necessity of low-carbon-forming characteristics, high resistance to oxidation, ability to be fed in small amounts while still forming full lubrication and high flash and fire points.

The low-carbon-forming characteristics are necessary to prevent the formation of troublesome cylinder deposits. Deposits forming on the discharge valves can often result in poor valve action, causing excessive cylinder temperatures. There have been experiences where such deposits, coupled with excessive lubrication, may have contributed to fires in the cylinders and intercoolers and in some cases, air-supply-line explosions. We feel that the proper rate of lubrication as well as use of the proper lubricant is part of the solution to this problem.

The low-carbon-forming characteristics of the naphthenic oils render them particularly suitable for air-compressor lubrication. The application of highly treated paraffinic rust and oxidation-inhibited oils is also highly successful. The important thing to consider is the deposit-forming characteristics of the oil.

Lubrication of the oil-compressor crankcase can usually be accomplished with the same oil that is selected for the cylinder lubrication. Of course, many of the compressors in use today are splash lubricated. Consequently, oils having the requirements listed for proper cylinder lubrication should be selected.

The service life of air-compressor crankcase oils is often limited by the service and conditions surrounding their operation. Care should be exercised to see that the crankcase oil is not permitted to remain in service for excessive periods of time. If such is permitted to occur, sludge formation and serious viscosity increase may result. There is no doubt that such developments could lead to serious problems calling for overhaul of the compressor. It is just that periodic investigations of the air compressor crankcase should be made every 6 months, and if it has been subjected to a high number of service hours, frequent drains may be advisable.

Sometimes moisture condensation will occur in the air-compressor cylinder, particularly in multistage systems. In such an event, a compounded oil having a viscosity qualifying it as an S.A.E.-30 grade oil should be used. However, such a compounded oil should be used only in the cylinder. Its application as a crankcase oil may result in early sludge formation and accompanying problems.

Auxiliary engines . . . The selection of the oil for auxiliary engines is usually based on the manufacturers' recommendations. In many cases these recommendations are quite liberal, and the oil being used in the larger engines will satisfy their requirements. This is most beneficial in retaining low costs because the gas-engine oil is usually secured in bulk quantities for tank storage. The miscellaneous grease-lubricated points of the auxiliary engines are satisfactorily lubricated with an industrial multipurpose grease as was discussed for use in electric motors.

Pump lubrication . . . Lubrication of cooling-water pumps, jacket-water pumps, and the like, is accomplished by both grease and oil lubrication. If such pumps are grease lubricated, the industrial multipurpose grease again can be applied with confidence. If they are oil lubricated, a high-quality rust and oxidation-inhibited oil, such as that recommended for air-compressor lubrication, is desirable.

DEMINERALIZATION UNIT includes control house at left, four cation units, four anion units, and vacuum deaerator tower.

How Gulf Purifies Its Boiler Water

Port Arthur refinery supplements condensate supply with demineralized water for supplying high-pressure boilers, thereby insuring against process shutdowns due to silica deposition on turbine blades and boiler tubes.

by Larry Resen
District Editor

A WATER demineralization plant is being used at Gulf Oil Corp.'s Port Arthur, Tex., refinery to prepare high-quality water for use as high-pressure boiler feed. The unit, which removes cations and anions in two successive steps, is used to supplement boiler-feed water obtained from condensate streams. It has a capacity of 1,800 r.p.m. of which about 1,200 g.p.m. is being used under current conditions.

Heart of the demineralization — or deionization plant is an automatic sequential control which provides for push-button control for regeneration of the ion-exchange resins. Elaborate timing and control mechanisms provide automatic measurement, dilution, and injection of acid and caustic streams which are used to regenerate these resins.

Installation of the demineralizer was prompted by Gulf's increasing use of steam drives and the need for high-pressure and high-temperature steam in these systems. With the use of high-pressure and high-temperature steam comes the attendant problem of silica deposition. The most-practical way of combating this is to use high-quality boiler-feed water, free of silica and other contaminants. The demineralization unit designed and built by the Permutit Co., provides this high-quality water.

Over recent years, Gulf has been installing centrifugal compressors powered by steam turbines on its process units. Turbine drives also have been installed on other unit facilities such as charge pumps. It is imperative that these units operate continuously between turnarounds without unscheduled shutdowns. Silica deposition can reduce horsepower output and cause early shutdowns.

Use of low-pressure steam would eliminate this difficulty and simplify treating problems since silica deposition on turbine blades is not troublesome when operating at a low pressure. However, the physical size of both boiler houses and turbines necessary at low pressures make this route impractical on large installations. Efficiency is naturally greater at higher pressures.

The size and cost of high-pressure installations, however, make inclusion of a spare turbine both impractical and uneconomical. Hence, the emphasis has to be placed on eliminating potential troubles at their source. In this case, it means the water has to be cleaned up before it ever becomes steam and reaches the turbines, or boiler tubes, for that matter. Gulf uses 650 lb. and higher steam in these systems.

Gulf Water System

The water-supply system at Gulf's plant includes both salt and fresh-water sources. The former is pulled out of the turning basin and drainage canal and pumped through cooling units on a once-through basis at 160,000 g.p.m. Fresh water from the Lower Neches Valley Authority System enters the plant at the rate of 18,100 g.p.m. and goes into various process and cooling systems. Part of this passes through a zeolite treating plant and is used in the production of low-pressure steam. About 1,200 g.p.m. is processed at the demineralizer and joins refinery condensate as high-purity boiler feed water for high-pressure boilers.

In the first stages, fresh water to be deionized is passed first through coagulating basins to reduce its turbidity and then goes through a gravity filter system prior to pumping to the demineralizing unit. The route of the water as it is ionized will be discussed first and then be followed by a description

of the regeneration cycle and the control setup.

Filtered water . . . This enters the cation units in parallel flow. Normally, all four of these vessels are in operation. They are individually taken offstream for regeneration and then returned to service. Fig. 1 shows the various flows through the plant in all phases: In service, backwash, regenerating, rinsing. This is merely for illustrative purposes and only one vessel is in regeneration at a time, which involves the latter three phases. It is then immediately returned to service.

Cation Units

Each cation unit is a vertical vessel with dished heads at top and bottom. They stand 14 ft. high with 11-ft. diameters. Each is charged with a sulfonated styrene type of cation-exchange resin having only SO_3H exchange groups. The resin is charged to the units to a bed depth of 30 in. This is supported by graded layers of anthracite coal.

A bed such as this will have a run of 593,000 gal. after which regeneration is required. The cation and anion units are both oversized to handle increased quantities in the future by increase in resin-bed depth.

Water enters each vessel through its top and discharges through an internal distributor. The vessels are full continuously so that incoming water displaces the water already in the vessel. As the water passes downward over the resin bed, cations are removed from the water by the resinous molecules in exchange for hydrogen ions.

How it works . . . The resin acts to remove cations preferentially, first picking up Ca^{++} ions, then Mg^{++} and finally Na^{+}. Thus, as the process continues, the resinous bed, in effect, divides into four layers. The topmost containing resin molecules laden with calcium ions, the next one down contains magnesium ions, the next one sodium ions, and finally the fourth layer which contains fresh resin with hydrogen ions still present.

As ionization proceeds, the cations migrate downward also on a preferential basis. Hence, as more calcium cations are extracted from the water, a greater bed volume is needed to accommodate them and they displace some magnesium ions in the next lower layer.

The magnesium ions, in turn, displace sodium ions in the next lower layer. The displaced sodium ions plus additional ones removed from the water, displace hydrogen ions in the bottommost layer. This process continues until the bottom layer is no longer able to pick up sodium ions.

Here are the principles of demineralization by ion exchange*

The dissolved mineral matter in water is not present as undissociated salts but is instead present as equal quantities of positively charged cations and negatively charged anions. Those most commonly encountered in various water supplies are shown in the following table:

Cations	Anions
Calcium—Ca^{++}	Bicarbonate—HCO_3^-
Magnesium—Mg^{++}	Carbonate—CO_3^{--}
Sodium—Na^{+}	Sulfate—SO_4^{--}
Potassium—K^{+}	Chloride—Cl^-
Iron—Fe^{++}	Nitrate—NO_3^-
Manganese—Mn^{++}	Silicate—$HSiO_3^-$
Aluminum—Al^{+++}	Silicate—SiO_3^{--}

In two-stage system without degasifier, the cations are removed by a hydrogen-cation exchanger and the anions are removed by an anion exchanger.

On the hydrogen-exchange run, the metallic cations are taken out of the water and an equivalent number of hydrogen ions are given in exchange. On regeneration, the acid used removes the accumulated metallic cations and restores hydrogen ions to the exchanger.

When a water containing bicarbonates of calcium, magnesium, sodium, potassium, iron, or manganese is passed through a hydrogen cation exchanger, the metallic cations are removed and held by the exchanger which gives up an equivalent amount of hydrogen ions in exchange. These unite with the bicarbonate radical to form carbonic acid and this breaks down to form carbon dioxide and water. Using calcium bicarbonate as an example, and using the symbol Z to represent the complex cation-exchanger radical, the reaction is as follows:

$$\underset{\text{Soluble}}{Ca(HCO_3)_2} + \underset{\text{Insoluble}}{H_2Z} \rightarrow \underset{\text{Insoluble}}{CaZ} + 2H_2O + 2CO_2$$

The carbon dioxide formed may then be removed by passing through a degasifier or by passing through a highly basic anion exchanger.

When a water containing sulfates, chlorides, or nitrates of calcium, magnesium, sodium, or potassium is passed through a hydrogen cation exchanger, the metallic cations are removed and held by the exchanger which gives up an equivalent amount of hydrogen ions in exchange.

Since an equivalent amount of the anions of sulfate, chloride, or nitrate are also present, the net effect is a dilute solution of sulfuric, hydrochloric, or nitric acids. Using calcium sulfate as an example and Z as the symbol for the complex cation exchanger, the reaction is as follows:

$$\underset{\text{Soluble}}{CaSO_4} + \underset{\text{Insoluble}}{H_2Z} \rightarrow \underset{\text{Insoluble}}{CaZ} + \underset{\text{Soluble}}{H_2SO_4}$$

These strongly ionized acids—sulfuric, hydrochloric, or nitric, are then removed by an anion exchanger.

When the useful exchange capacity of the cation exchanger is exhausted, it is regenerated with an acid, either sulfuric or hydrochloric, which removes the accumulated cations of calcium, magnesium, sodium or other cations, and simultaneously gives up an equivalent amount of hydrogen cations in exchange thus restoring the cation exchanger bed to its original hydrogen state. The acid usually used for this regeneration is dilute sulfuric acid. Hydrochloric acid is also an excellent regenerant.

Using a calcium cation exchanger as an example, the symbol Z to represent the complex cation-exchanger radical and sulfuric acid as the regenerant, the reaction is as follows:

$$\underset{\text{Insoluble}}{CaZ} + \underset{\text{Soluble}}{H_2SO_4} \rightarrow \underset{\text{Insoluble}}{H_2Z} + \underset{\text{Soluble}}{CaSO_4}$$

Anion exchangers . . . There are two types of anion exchangers—the highly basic type and the weakly basic type. Only the former will be discussed. Both the highly basic and weakly basic anion exchangers will remove strongly ionized acids such as sulfuric, hydrochloric, or nitric. However, only the highly basic anion exchangers will remove weakly ionized acids such as silicic acid.

This is not volatile at ordinary temperatures and cannot be removed by degasification. It is very weakly ionized and must be removed by means of a highly basic anion exchanger.

Using the removal of silica, as silicic acid, as an example, assuming that silicic acid is taken up as $HSiO_3$ and using R_4N as the symbol for the complex anion-exchanger radical, this reaction may be written as follows:

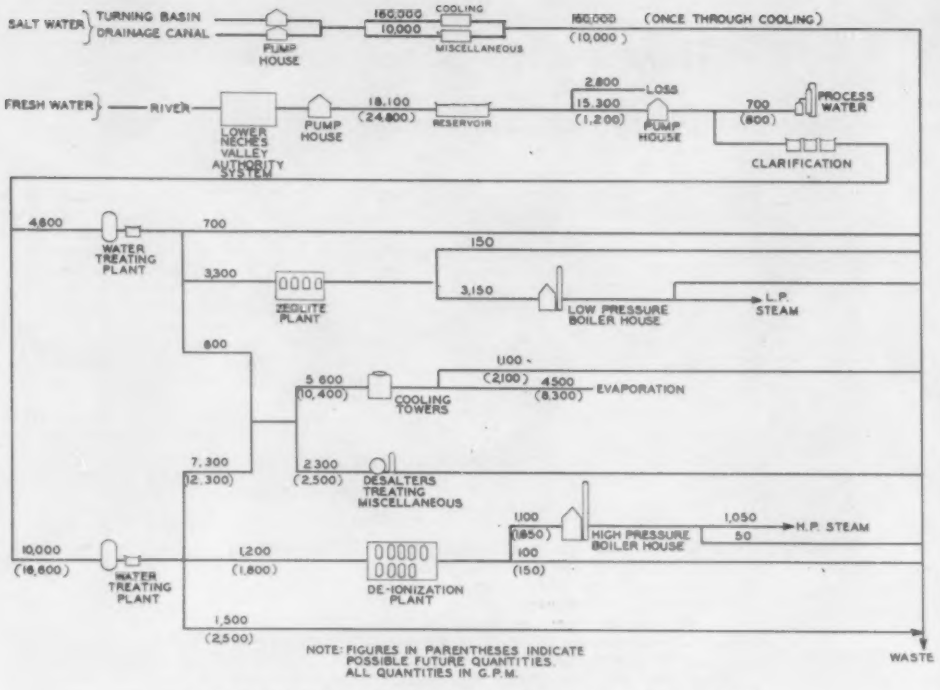
$$\underset{\text{Soluble}}{H_2SiO_3} + \underset{\text{Insoluble}}{R_4NOH} \rightarrow \underset{\text{Insoluble}}{R_4NHSiO_3} + H_2O$$

When the useful exchange capacity of an anion exchanger is exhausted it is regenerated with an alkali which removes the accumulated anions in the form of their soluble salts and restores the anion exchanger to its original state. Highly basic anion exchangers are regenerated with caustic soda. Using the sulfate of a highly basic anion exchanger as an example and the symbol R_4N to represent the complex anion-exchanger radical, the regeneration reaction may be written as follows:

$$\underset{\text{Insoluble}}{(R_4N)_2SO_4} + \underset{\text{Soluble}}{2NaOH} \rightarrow \underset{\text{Insoluble}}{2R_4NOH} + \underset{\text{Soluble}}{Na_2SO_4}$$

Chloride, nitrate, carbonate, and silicate are removed in a similar way by regeneration with caustic soda which removes the acids in the form of their sodium salts and simultaneously restores the anion exchanger to its original state.

*Condensed from Permutit Co. Bulletin 3803B-5-56.



WATER SYSTEM at Gulf Oil Corp.'s refinery at Port Arthur. Fig. 1.

The sodium ions finally remain in the outgoing water and this breakthrough is an indication that the resin has been exhausted and the vessel must be regenerated.

Anion Units

Water from which cations have been removed flows out of the bottom of the vessel and through the multiport valve, which directs it into the top of the anion unit. The water here goes through the identical flow as in the cation unit. However, anions are picked up by the resin in exchange for hydroxyl groups.

Sulfate, chloride, carbon dioxide, and silica are thereby removed from the water and the hydroxyl ions they displace are able to combine with free hydrogen ions to produce some additional water in the process. The anion vessels are slightly larger than the cation units, having the same 11-ft. diameter, but a height of 16 ft. They are charged with a highly basic quaternary amine polystyrene exchange resin containing alkyl groups in a quaternary structure. The anion resin has a bed depth of 45 in., with a service run of 428,000 gal.

Preferential exchange . . . Again, a preferential-exchange procedure takes place in the process. As the acidic groups pass through the resin, sulfate is removed then chloride, next carbon dioxide, and finally silica. Stratification also takes place within the bed. In the anion unit, it's the silica which is removed last and which will break through into the outgoing water first as the bed becomes exhausted.

The purified water leaves the bottom of the anion unit, goes through the multiport valve, which directs it into the top of a vacuum deaerator. This 8-ft. diameter by 25-ft. vessel is a packed tower, Rachig rings, through which water percolates while entrained oxygen is removed. Steam jets are used to pull the vacuum, and noncondensable gases and water vapor are drawn upward through the packing and eliminated through a barometric condenser.

Removal of oxygen . . . This is quite important since demineralized water containing oxygen is aggressive toward steel and any iron picked up would be detrimental to boiler operation. Deaeration which removes the oxygen makes it possible to use plain carbon steel for handling the water and this is the case as the water leaves the deaerator.

However, prior to this point, special precautions were necessary throughout the demineralizing unit. All piping was rubber lined. Individual vessels—cation and anion units, deaerator—were also rubber lined. Special fittings were made of either plastic or stainless steel, depending on their service and particular atmosphere they met.

Surge-tank lining . . . A final precaution was taken in storing the purified water. After leaving the deaerator, demineralized water is piped through carbon-steel distribution lines to surge tanks at various boiler locations in the plant. These surge tanks receive incoming streams of condensate as well as the deionized water. The tanks have open tops, and again the problem of corrosion enters the picture.

The severity is quite high here, since in addition to the oxygen present in the atmosphere, much of the condensate enters the surge tanks at raised temperatures. To offset this condition, a special protective coating system was used on these tanks. They have been lined with a catalytically cured epoxy-modified phenolic coating system.

Over-all flow-rate control of the plant is governed by a flow controller downstream of the discharge pump from the deaerator. This controller affects the level in the bottom of the deaerator. If it is pinched back, the level will rise, causing the level controller there to pinch back on the flow of deionized water into the deaerator.

The flow of water into the deaerator is the amount flowing in series through anion and cation units. Thus when it is pinched back, the effects are felt all down the line.

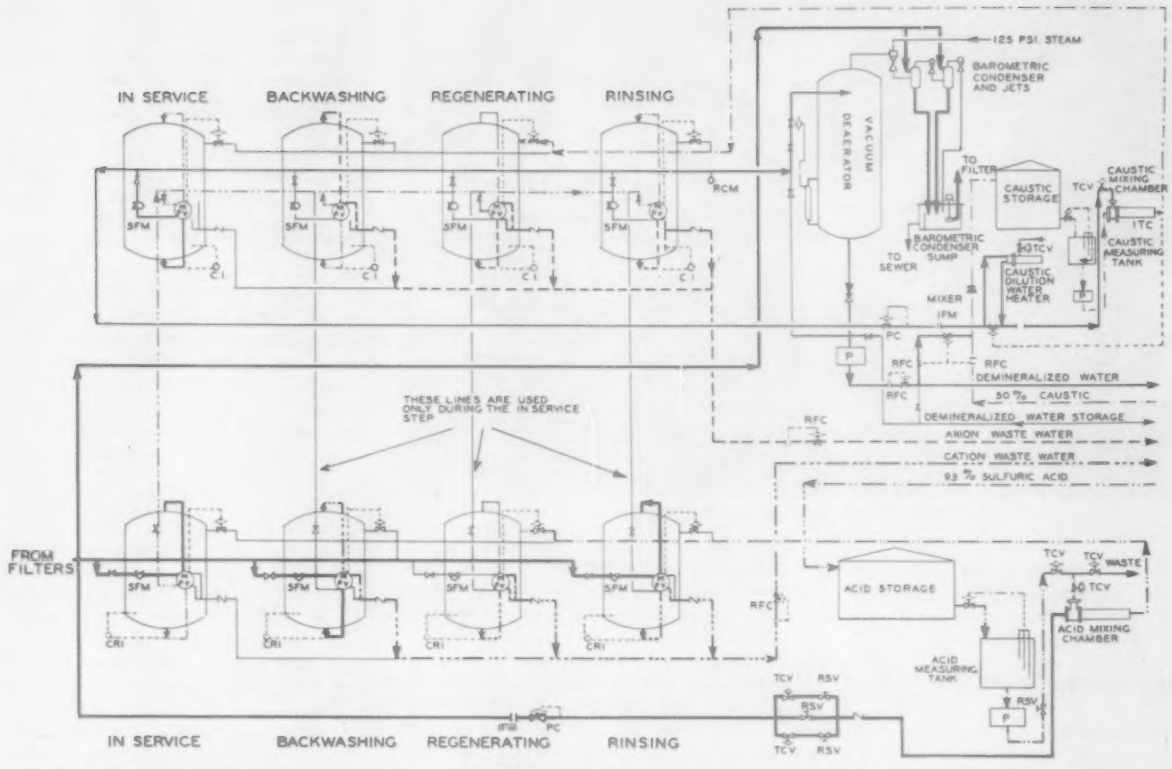
Installation of the D-I plant has provided condensate quality water for use in high-pressure boiler systems. In Table 1, under typical analyses, the quality of the finished water may be compared with raw water. Significantly, silica content in actual p.p.m. is reduced from 9 to 0.01.

Regeneration

Once the cation resin in a unit has been exhausted, or is nearing exhaus-

TABLE 1—TYPICAL ANALYSIS

P.p.m. as $CaCO_3$	Raw water	Finished water
Ca	35	0-1
Mg	16	0-1
Na	85	1-2
Alkalinity	19	1-2
SO_4	54	0-1
Cl	63	0-1
P.p.m. (actual)		
CO_2	4	0-1
SiO_2	9	0.01



DEMINERALIZATION INSTALLATION at Gulf's Port Arthur plant. Fig. 2.

PC	PRESSURE CONTROLLER
LC	LEVEL CONTROLLER
CI	CONDUCTIVITY INDICATOR
TI	TEMPERATURE INDICATOR
RFC	RECORDING FLOW CONTROLLER
IFM	INDICATING FLOW METER
SFM	SPARLING FLOW METER
MPV	TIMER CONTROLLED MULTI PORT VALVE
RSV	RATE SET VALVE
TCV	TIMER CONTROLLED VALVE
ITC	INDICATING TEMPERATURE CONTROLLER
RCM	RECORDING CONDUCTIVITY METER
CRI	CONDUCTIVITY RADIO INDICATOR

PARTIALLY TREATED WATER
DEMINERALIZED WATER
50 % CAUSTIC
DEMINERALIZED WATER STORAGE
ANION WASTE WATER
CATION WASTE WATER
93 % SULFURIC ACID
FROM FILTERS

NOTE: NORMALLY ALL UNITS ARE IN SERVICE. WHEN EXHAUSTED, UNITS ARE REMOVED FROM SERVICE ONE AT A TIME AND PUT THROUGH BACKWASHING, REGENERATING, AND RINSING SEQUENCES AND THEN RETURNED TO SERVICE.

tion, regeneration has to take place. This actually involves a three-part cycle; backwashing, acid introduction, and rinsing. As has been noted, the multiport valve is the heart of the operation. This is coupled with timers, and once the regeneration cycle is activated by push-button control via the operator, the cycle automatically continues to completion. The multiport valve diverts flow of water and regenerant as required.

Normally, all the cation or anion units are onstream at one time, and only one is pulled off for regeneration as needed.

A typical cation run is 593,000 gal. of water. Once this amount passes through the 30-in. bed, the regeneration cycle is started whether or not tests or recording devices indicate exhaustion. To this end, a gallonage counter is equipped with an alarm which warns the operator once the maximum throughput has been reached.

Although it often is possible to continue the run somewhat longer, experience has shown that it's best to pull the unit offstream and regenerate without going to the absolute exhaustion limit. This gives a more uniform and simplified operation. Run lengths are adjusted at frequent intervals to obtain maximum use of capacity.

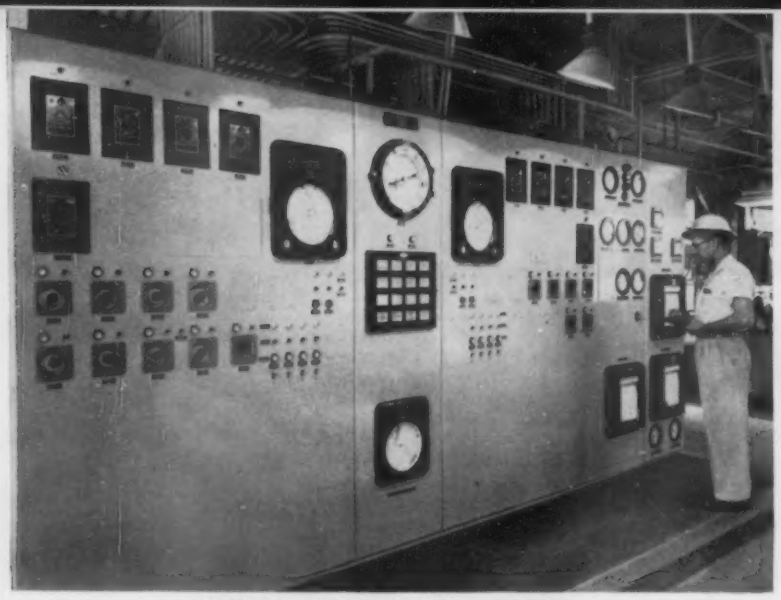
Determining Bed Exhaustion

Several other checks are used. A conductivity ratio indicator is one of these. Electrolytic or solution conductivity is a measure of the ability of a solution to carry an electric current. This is called specific conductance and is measured in mhos. Highly-quality condensed stem, distilled or demineralized water, will have specific conductances as low as 1 micromho (one millionth of a mho). Since water entering the cation unit and that leaving the unit has relatively high specific conductances, and since incoming water can vary widely in this respect, a single conductivity indication loses its value.

Conductivity rate . . . To compensate for this condition, the cation units are equipped with Enditrol instruments which show the ratios of specific conductances in the lower portion of the resin bed and in the outgoing stream of water. The beds exhaust from top to bottom so that the lowest portion of the resin bed is passing water from which cations have been removed.

One probe of the instrument measures the conductivity in the bed, another probe measures the outgoing water's conductivity, and the ratio of these is recorded. During the service run, this ratio will be 1, since water at both probe points is the same. However, as the end of the run is approached and the resin in the bottom of the bed is gradually exhausted, the conductivity near this point will increase, while that of the outgoing water remains constant. When this ratio reaches 1.2, the control starts an alarm and the operator will proceed with regeneration. The free-mineral acidity also offers a check on the unit.

Backwash . . . The first step in the regeneration cycle is a backwash with filtered water. This water enters the cation unit through the multiport valve,



CONTROL PANEL on Gulf's demineralization unit.

but is directed to the base of the unit on reverse flow. It enters there and carries upward, loosening up the bed and passing out through the top and again through the multiport valve which diverts it to waste.

Regeneration . . . With backwash completed, the bed settles down and actual regeneration takes place in the second phase of the cycle. Sulfuric acid is introduced into the cation unit, and this serves to remove the cations and replace them with hydrogen ions. In this way, the bed is restored to its original condition and the cations are removed as salts in solution.

A complicating factor here, however, is the varying solubility of the different sulfates formed—calcium sulfate, magnesium sulfate, and sodium sulfate. Different strength acids are used to regenerate the bed. Thus, 2 per cent acid is required to eliminate the bulk of the calcium ions. While this same concentration could be used for the entire regeneration, a more-complete job is done by using 5 per cent for magnesium ions and 10 per cent for sodium ions. If the strong acid is first introduced, however, calcium sulfate will drop out of solution and deposit in the resin. This problem, incidentally, does not exist with hydrochloric acid, but sulfuric acid is less costly here.

Sulfuric acid at 93 per cent strength is stored in a tank within the confines of the demineralization plant. It is charged to an acid-measuring tank which by use of electronic liquid-level controls holds the fixed amount required to regenerate a cation unit.

The 93 per cent acid is pumped at a fixed rate out of the measuring tank and into an acid-mixing chamber where it is mixed with filtered water. The filtered water entering the mixing chamber passes through a set of three rate valves in parallel. These valves are set so that water passes through at a constant rate.

When regeneration acid is first introduced into the cation unit, it has to be at 2 per cent. Hence, all three valves are open and the maximum amount of water enters the mixing chamber and acid is diluted to the desired concentration. The fixed water flow through the three valves when added to the fixed rate of flow of acid, provides the necessary quantities of each to obtain the desired concentration.

The 2 per cent acid flow is continued for a predetermined time. This time is set on a timer which, after the preset interval, closes one of the three water valves. Water flow then continues through two valves resulting in a 5 per cent acid feed for a second preset time interval at the end of which the second valve is closed.

Thereupon, the water continues to flow through the one valve remaining open, making a 10 per cent acid, until the acid valve in the feed tank falls to the desired minimum. At this point, the level control mechanism on the acid tank closes the two valves on the acid line to the mixing chamber, opens the valve to waste, stops the acid pump, and starts the slow-rinse timer. Thus water continues to flow through the acid-mixing chamber and the cation unit.

"Slow rinse" . . . This part of the cycle is known as the slow rinse, the purpose of which is to displace the acid left in the spaces between the resin particles without unduly disturbing the resin bed. The time required for the slow rinse is determined by experience and the slow-rinse timer is set accordingly. When the required time has elapsed, the timer operates to move the multiport valve into the fast-rinse position, which also causes the regeneration inlet valve to close. During the fast rinse the water enters the unit as if the unit were deionizing. However, it leaves through the waste line.

Rinsing continues until the free-mineral acidity is 10 per cent higher than normal, at which time the cation unit is placed back onstream.

Timers are used on the rinse periods and with operating experience acquired, the operators can preset these to provide an ample rinsing time. To insure against incomplete rinsing, the final-rinse timer is tied in with an interlock assembly. If the conductivity of the outgoing stream is not within limits, the rinse will be continued regardless of the timer and until satisfactory rinsing has been achieved.

Anion-unit regeneration is exactly similar in sequence with one exception. Since only one contentration of regenerant is required, there is no need for multiple controls on the water input to the mixing chamber. A constant water rate enters the mixing chamber along with a constant caustic rate. The regenerant, 34 Baumé caustic, is introduced into the anion unit at 5 per cent until the desired amount has been used.

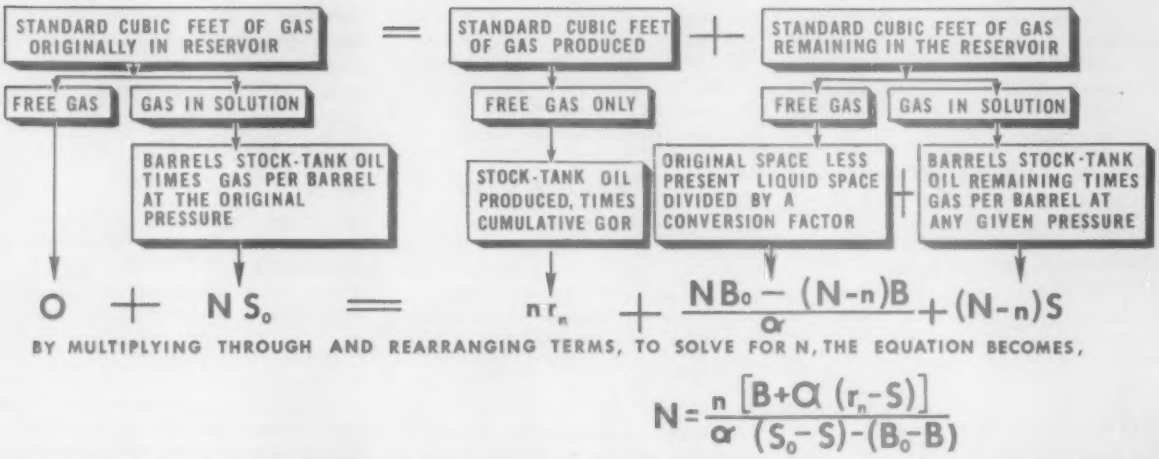
Deionized water is used for diluting the caustic. This water passes through a heat exchanger and then joins the caustic in a mixing chamber to be introduced into the anion unit at the desired strength. The caustic is heated this way to 130° F. and raises the bed temperature to 90° F., the temperature necessary for efficient removal of silica.

As with the cation cycle, the desired amount of caustic is drawn from a measuring tank. When the level therein drops sufficiently, the caustic and water flows are cut off and the rinsing cycle is started with decationized water. The caustic picks up the various anions and these are discharged to waste as is the rinse water. When rinsing is completed, the unit is returned to service.

Three controls are used to indicate anion bed exhaustion; conductivity indication, pH recorder, and silica analysis. The pH is normally the first indicator, and it drops abruptly when silica starts to break through into the outgoing water. Presence of silica is next detected and this is followed by an increase in conductivity.

Acknowledgments

Cooperation of the management of Gulf Oil Corp. in release of this information is gratefully acknowledged, as is the assistance of Marshall Elliott, Fred Owens, and Ralph Gulley of Gulf and N. A. Voss, Permutit Co., Houston.


STANDARD CUBIC FEET OF GAS ORIGINALLY IN RESERVOIR
=
STANDARD CUBIC FEET OF GAS PRODUCED
+
STANDARD CUBIC FEET OF GAS REMAINING IN THE RESERVOIR
FREE GAS
GAS IN SOLUTION
FREE GAS ONLY
FREE GAS
GAS IN SOLUTION
BARRELS STOCK-TANK OIL TIMES GAS PER BARREL AT THE ORIGINAL PRESSURE
STOCK-TANK OIL PRODUCED, TIMES CUMULATIVE GOR
ORIGINAL SPACE LESS PRESENT LIQUID SPACE DIVIDED BY A CONVERSION FACTOR
BARRELS STOCK-TANK OIL REMAINING TIMES GAS PER BARREL AT ANY GIVEN PRESSURE
O + N S_o = n r_n + (N B_o − (N−n) B)/α + (N−n) S

BY MULTIPLYING THROUGH AND REARRANGING TERMS, TO SOLVE FOR N, THE EQUATION BECOMES,

$$N = \frac{n\,[B + \alpha\,(r_n - S)]}{\alpha\,(S_o - S) - (B_o - B)}$$

THE MATERIAL-BALANCE EQUATION for a solution-gas-drive reservoir determines reserves from production history. N is the desired number of barrels of oil originally in place; n is the number produced. B_o and B are initial and present formation-volume factors. S_o and S are original and present gas content of the oil in the reservoir. α is the barrels of reservoir space occupied by one standard cubic foot of gas not in solution. Fig. 10.

What you should know about

Evaluating an Oil Property

Oil reserves, participation, value of oil, and operational expenses are all part of the total picture in determining the cash realization from a property. Here is how they're all tied together.

by E. A. Polumbus, Jr.

Part 2 of Two Parts

PART 1 (January 21, 1957) pointed out that determining oil reserves of a property is one of the most important steps in an evaluation. It described the basic preliminary information needed for reserves analysis. As an illustration of reserves estimates, a typical Denver-Julesburg basin field is analyzed. Part 1 showed the initial volumetric analysis.

Later analysis . . . In this example it is assumed now that 3 years have elapsed since the field was first discovered. The reservoir is fully developed, and gas, oil, and water-production records have been carefully kept. Gas-oil-ratio data have been accumulated, and reservoir pressures have been measured.

Sufficient data are at hand to attempt an estimate of future reserves by a series of solution-gas-drive, material-balance calculations. The material-balance formula shown in Fig. 10 is nothing more than an expression of the fundamental laws of conservation of matter and energy as applied to a reservoir. This states that the amount of gas originally in the reservoir must be equal to the amount of gas produced plus the amount of gas remaining in the reservoir. The accumulative stock-tank oil recovered at any time is designated by the symbol n.

The equation is not used as shown, but is set up in tabular form on large columnar paper for ease in arithmetical calculation. The technique of applying this equation to predict future reserves and determine recovery efficiency involves assumptions of incremental oil production for specific decreases in reservoir pressure. When the assumption of oil produced is correct, a group of computations will show that certain variables in the equation are simultaneously satisfied and that the equation will "balance." This procedure is repeated in successive steps until the prediction reaches depletion conditions.

A series of material balances was run on the hypothetical field, and the reserve estimate indicated an ultimate recovery of 2,778,000 bbl. of oil, as shown on the following table:

MATERIAL BALANCE RESERVE ESTIMATE

	Avg. daily rate of oil prod.	Oil prod.
Actual, first 3 years		608,080
Future years:		
1	1,700	620,500
2	1,030	375,950
3	710	259,150
4	525	191,630
5	410	149,650
6	340	124,100
7	285	104,030
8	240	87,600
9	210	76,650
10	185	67,520
11	165	60,220
12	145	52,920
Total future reserve		2,169,920
Total ultimate reserve		2,778,000

These data indicate that the solution-gas drive will not be as efficient as originally estimated in the volumetric calculations.

Further refinement . . . Now assume that another 3 years have passed. Continuing analyses of decline-curve data show that a decline trend is beginning to be established. An extrapolation of

Author is petroleum consultant, Denver. Article is a portion of an address presented at the second annual Rocky Mountain Mineral Law Institute, 1956, in Boulder, Colo. It is part of a book of the proceedings published by Matthew Bender & Co., Albany, N. Y.

PRODUCING

the pool decline curve (Fig. 9), (Part 1), which is based on production rates of all wells in the reservoir, indicates the ultimate reserve by this method to be 2,841,000 bbl. of oil as shown in the following table:

DECLINE-CURVE RESERVE ESTIMATE

	Avg. daily rate of oil prod.	Prod.
Actual, first 6 years		1,844,930
Future years:		
1	598	218,270
2	480	175,200
3	384	140,160
4	305	111,320
5	244	89,060
6	195	71,170
7	155	56,570
8	124	45,260
9	98	35,770
10	78	28,470
11	68	24,820
Total future reserve		996,070
Total ultimate reserve		2,841,000

This estimate is lower than the original volumetric estimate, although it is somewhat higher than the last material-balance estimate. It is possible that the reservoir is now benefiting from the effects of gravity drainage, a not unusual occurrence in later stages of depletion in a solution-gas-drive reservoir.

COMPARISON OF RESERVE ESTIMATES

Type estimate—	Time from discovery to date of estimate	Estimate ultimate oil reserve, bbl.	Per cent change from volumetric
Volumetric	6 months	2,961,000	
Material balance	3 years	2,778,000	—6.2
Decline curve	6 years	2,841,000	—4.2

The reserve estimates are all within 6.2 per cent of one another, which is a degree of conformance to be desired but not always attained in actual practice. Quite often the lack of good basic data forces the engineer to assume critical information; eventually, the assumptions may prove wrong in part or in entirety. Under these circumstances, the earlier reserve estimates will, of course, be in error. In extreme cases, the variations of 50 to 100 per cent in reserve estimates may occur.

Limitations of methods . . . A realistic reserve estimate is the foundation of an evaluation, and it is the prime responsibility of the reservoir or evaluation engineer to provide such an estimate. Nevertheless, it cannot be overemphasized that, regardless of the most diligent and conscientious efforts on the part of the engineer, the accuracy of a reserve estimate is often beyond his control. The reason behind this paradoxical situation may be summarized in one word: DATA. Stated more fully, **the reliability of a reserve estimate, and therefore of the evaluation, cannot be expected to exceed the limitations imposed upon it by the quality and availability of basic information.** The significance of this statement may be seen in the following table:

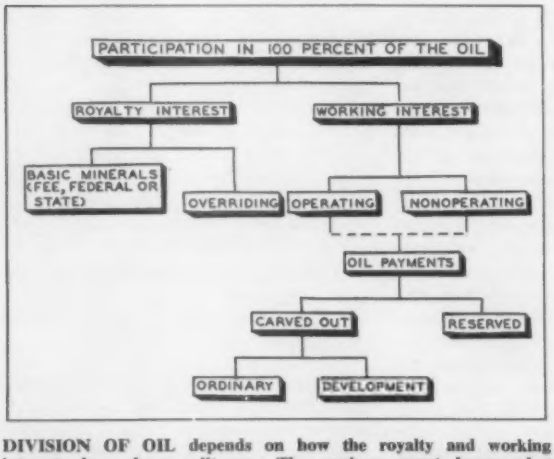
RELATIVE ACCURACY OF OIL RESERVE ESTIMATES

Per cent depletion of ultimate oil reserve	Method of estimate—	Per cent deviation of estimate from actual ultimate reserve: Possible	Reasonable range
1-10	Comparative and volumetric	50-100	5-30
10-30	Volumetric and material balance	50	5-20
30-60	Material balance and decline curve	30	5-10
60 and over	Decline curve	15	to 5

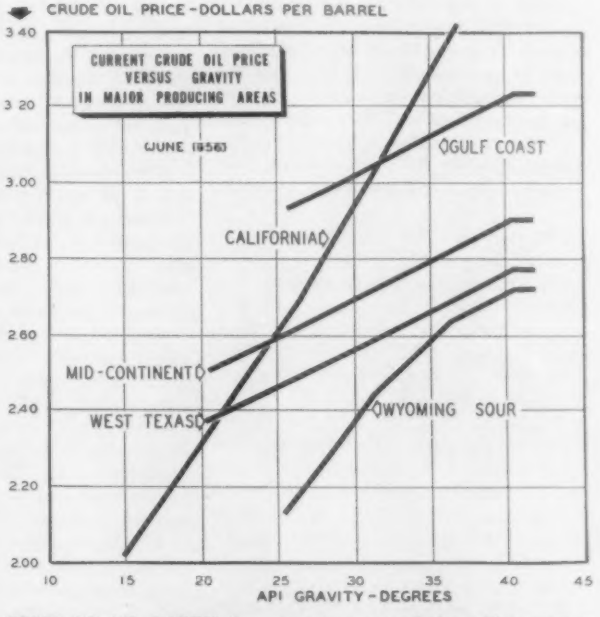
The table suggests that with the passage of time and the accumulation of data of good quality, reserve estimates tend to become more reliable. It also draws attention to the fact that a single reservoir evaluation is seldom final, but becomes out of date and subject to frequent reexamination and adjustment.

Analyzing a part . . . The discussion to this point has dealt with the total reservoir. More often, however, the evaluation engineer is concerned with a property that represents a small ownership in the reservoir. In this case he gives particular attention to the formation and production information obtained from wells drilled on the property itself, although he is still obliged to analyze these data from a position of commanding knowledge of the reservoir as a whole.

Migration of oil across individual lease boundaries due to such factors



DIVISION OF OIL depends on how the royalty and working interests have been split up. The engineer must know what fraction of the working interest the evaluation is based on. Fig. 11.



PRICE OF OIL VARIES from area to area and also with respect to market location. The engineer should be aware of what it costs to get the oil to market in order to place a reliable value on it. Fig. 12.

as unbalanced withdrawals, lateral changes in reservoir rock characteristics, position of lease relative to structure, and differences in productivity of wells, may cause gain of oil by one property with resulting loss of oil from another. For instance, an actual analysis of a reservoir in the Denver-Julesburg basin indicated an over-all ultimate recovery of 26 per cent of the original stock-tank oil in place. Studies of the performance of individual leases, however, indicated recoveries varying from 15 to 50 per cent of the original oil underlying the respective leases.

Failure to recognize the problem of migration of oil across lease boundaries often leads to a source of error in reserve estimates. Even experienced engineers may encounter considerable difficulty in arriving at specific allowances for offset drainage conditions.

Participation

The simplest form of participation in rights to oil production is ownership of lands in fee. In this event there is no distribution of the oil other than to the fee owner who develops and produces the oil for his own account. Only in rare instances do such complete ownerships exist. More commonly the ownership is divided as depicted in Fig. 11.

The principal division in the ownership of oil is between the royalty or mineral interest and the working or leasehold interest, and originates in an oil and gas lease which conveys rights to the working interest to search for oil and gas and exploit any found. In exchange for these rights, the royalty owner retains a share of the oil produced, unburdened by any costs of exploration, development, and production.

. . . **The basic royalty** oil accrues to the account of the owner of the mineral rights, the lessor, who is usually the landowner of the property. Overriding royalty interests may exist in addition to the basic royalty. An overriding royalty often constitutes a form of compensation for services rendered by those who are involved in negotiations for mineral or leasehold rights.

Basic royalties usually call for a one-eighth or a one-sixth share of the oil produced. Under very favorable circumstances, when the oil reserve is enormous relative to the development and production costs, total royalty interests have been known to exceed 50 per cent of the gross oil.

The total royalty interest burden which an oil property can stand is determined by its effect on payout of development costs and the economically limiting rate of production. Many negotiations involving transfer of ownership of producing and nonproducing oil interests fail to be consummated because of demands for overriding royalty interests that reach beyond the point of economic soundness to the working interest.

. . . **The working interest** owner, in return for the right to search for and produce oil at his sole expense, receives all oil produced excepting that reserved to the royalty interests. If the working interest is owned jointly, one of the owners may be designated operator.

Usually the nonoperating interests, as well as the operating interest, share in the development and production costs in proportion to their separate ownerships in the working interest. This is not always the case, however. As an example, some of the working-interest owners may agree to conditions under which "carried" working interests are provided those that may have contributed services of one kind or another. The oil accruing to the working interest generally does not exceed seven-eighths of the gross production, and depending upon the nature of the royalty interests, frequently is less than this.

On occasion, a working-interest owner may desire to sell either the working interest itself, or a part of the future value of the working interest. Because of the large sums involved and the complex tax problems facing both buyer and seller in such transactions, it is sometimes convenient for all concerned to effect a change in ownership through use of a production, or oil payment.

. . . **An oil payment** carries an obligation to pay the holder a specified monetary consideration or number of units of production dischargeable only out of oil runs from the property. It is similar to an overriding royalty interest in that the payment is, in most instances, free and clear of all development and operating costs. But because of tax considerations, it can be distinguished from the override in that it terminates before the property is depleted.

If the working-interest owner conveys ownership to another but retains a production payment, a "reserved" payment has been created. If the working-interest owner wishes to assign part of the future productive worth of the property in order to realize immediate monetary value, yet retain full working-interest ownership rights, an oil payment is "carved out" of the working-interest production.

With an ordinary carved-out payment, there is no restriction on the operator regarding use of the funds. Sometimes, however, the proceeds are pledged for payment of services and equipment in connection with development of the property out of which they are carved, in which case the carved-out payment is termed a "development" payment. The amount of production assigned for liquidation of an oil payment varies with the type of transaction made.

. . . **In evaluating** a divided working interest, the engineer must know the fraction that the interest represents of the total so as to make proper charges for future investment costs and operating expenses. He must know the total of the various royalty interests in order to compute the net fraction of gross production corresponding to that working interest. Also, he must be aware of oil payments which may cause changes in future allotments of production.

All this information is usually supplied the engineer by the operator, and is accepted as presented. The engineer assumes no responsibility for vertification or preparation of division orders, this being the rightful domain of the legal profession.

Value

The value of oil is determined largely by market demand for oil of a particular gravity, and the cost of transportation to the refinery. The market price for oil increases with an increase in A.P.I. gravity, which is a rough measure of the more valuable natural gasoline components contained in the oil. As shown in Fig. 12, the prevailing price for a particular gravity oil in the major producing areas of the United States covers a wide range. This is a result of differences in oil economics among the regions, and of differences in the quality and characteristics of various crudes. In California, for instance, most of the production is low-gravity, asphaltic-base crude. Refiners are generally willing to pay a premium price for oil of 30° A.P.I. gravity or better.

. . . **The location of production** with respect to markets has a strong influence on the net price received for the oil. A property situated in an area of established oil activity and tied into a pipeline to a nearby refinery, may receive close to the actual posted price. If production is developed at a distance from rail and pipeline facilities, it may be necessary to truck the oil. In certain Rocky Mountain oil fields, trucking costs to a refinery or pipeline terminal have exceeded 80 cents per barrel. In times past, some oil production was so reduced in value by a combined lack of demand and remoteness from market that entire fields were shut in.

In areas served by liquid-extraction plants, the gas produced with the oil will provide an additional income as dry gas and associated liquid products equivalent to 5 to 15 cents per barrel of oil produced. If the gas contains

hydrogen sulfide and carbon dioxide, it is sometimes profitable to erect plants for recovery of these products.

It is absolutely essential that the evaluation engineer know precisely the net price of the oil at the lease tank battery. Failure to recognize the effect of such factors as trucking costs or probable future elimination of such costs and value of byproducts can seriously affect the over-all value assigned to an interest in a property.

Operational Expense

Operating expenses for an oil property fall into two general categories insofar as the evaluation is concerned. These are direct lifting expenses and indirect expenses. In most instances, the evaluation engineer is interested only in the direct charges against production of the property being evaluated. Indirect expenses are of more concern to the accountant, and are often handled as a pro rata charge among several properties on either a gross expense or a per barrel of production basis.

Direct lease operating expenses . . . Table 1 shows the major cost items accruing to direct lease expenses. Labor and supervision include wages and salaries of personnel and cost of automotive equipment and tools for each job classification. The time each man spends on a particular property can generally be assigned without difficulty.

TABLE 1—OIL PROPERTY OPERATIONAL EXPENSES

Direct Lifting Expenses

I. **Labor and Direct Lease Supervision**—Pumper, gager, mechanics, roustabouts, foreman, engineer, management; automotive equipment and tools.

II. **Surface and Subsurface Maintenance**—Well pulling to change pumps, repair tubing, clean out well; maintenance of roads, lines, heaters, treaters, and separators, pumps, water-disposal equipment, storage, etc.; miscellaneous supplies; contract labor and transportation; other.

III. **Fuel and Power**—Gas, gasoline, L.P.G., steam, and electricity.

IV. **Remedial and Other**—Chemical and mechanical well treatments, special repairs, workovers, recompletions in other zones; expensed items arising from concurrent lease exploration and development programs; other expenses.

Production Taxes

V. **Production Taxes**—Production and severance, ad valorem, conservation, etc. (More conveniently expressed as—cost per barrel).

Indirect Expenses

VI. **General Overhead and Administrative**—Legal, accounting, purchasing, management, insurance, interest.

VII. **Depletion**—Leasing, bonus, and other property acquisition costs, capitalized development costs.

VIII. **Depreciation**—Production, storage and transportation facilities.

IX. **Manufacturing Costs.**

Most items included under surface and subsurface maintenance, such as well pulling and repair of lease facilities, are contracted to service firms and therefore easily identified. The amount of well servicing varies considerably among producing areas, and for newly developed properties it is sometimes difficult to arrive at a reasonable estimate of future subsurface maintenance costs.

Remedial work may include chemical and mechanical treatment to wells, special repairs or workovers, and recompletions in the same or other oil-producing zones. If these costs can be anticipated, they may be itemized in the evaluation as an investment. More commonly they are unpredictable as to time of occurrence and are therefore handled in the evaluation by setting aside an average monthly allowance over a period of time.

In certain multiple-reservoir fields of Texas and California, a sum equivalent to the initial development and completion costs of a property will usually cover remedial and recompletion expenses occurring during a 30 to 40-year primary productive life.

With respect to properties still under development, lifting costs are sometimes found to be abnormally high, not only because there are fewer wells against which to distribute charges, but also because of nonrecurring expenditures for minor items of well and lease equipment which are charged to operating expenses.

Because of differences in accounting procedures among oil producers, charges into various accounts are not uniform. For this reason it is sometimes difficult for the evaluation engineer to determine items to be considered as direct expenses. Among the more important factors influencing lifting expenses are: crude-oil characteristics, number of wells, depth to producing formations, method of lifting the oil, volumes and types of sediment and water produced with the oil, excessive gas production, paraffin accumulation, and even lease accessibility and weather conditions.

Production taxes . . . Taxes levied directly on gross oil production or income and on the value of lease equipment, form another direct cost which is more conveniently treated separately on a per barrel basis. Severance taxes and gross oil revenue taxes in most states are about 2 to 5 per cent of the value of the oil produced, or generally from 5 to 15 cents per barrel.

Ad valorem taxes imposed by county governments vary greatly by tax district. They are usually levied on both oil production and on lease facilities and may be as little as 0.2 cent per barrel or more than 25 cents per barrel. Conservation, proration, stream pollution, and other miscellaneous taxes are often so insignificant they may be ignored in an evaluation.

Indirect expenses . . . Except with the better established oil operations, indirect expenses are not always clearly separable from direct expenses. Unless otherwise directed, the evaluation engineer excludes indirect costs from the evaluation. General and administrative expenses cover everything from a postage stamp to the salary of the chief executive officer, and can be handled by distributing a proportionate share back to each lease.

Depletion and depreciation records are maintained for each property, and cost accruing to these accounts are generally charged against the properties on a unit of production basis. Reserves, naturally, vary widely among properties, causing considerable variation in the depletion and depreciation costs per barrel of oil produced.

Investment and Salvage

At the time an evaluation is made, a substantial amount of the investment in development, completion, well equipment, and surface facilities already has been entered in the books. The engineering evaluation does not attempt to account for past expenditures of this kind. However, when undeveloped reserves are evaluated, the engineer must make an allowance for these expenditures, since they will be depleted or depreciated out of the new reserves developed. The evaluation is thus able to show the relative values of developed and undeveloped reserves.

The cost of drilling and equipping a development well can be as little as $7,000 for a very shallow cable-tool hole, or more than $250,000 for a deep rotary well. Depending upon how long such equipment is in use, the condition of the equipment, and the amount salvageable, the salvage value after abandonment costs may range from 15 to 50 per cent of the original purchase price and installation cost.

Realization

After having established the information pertinent to the five evaluation components, the engineer is ready to assemble these data in a manner to achieve the objectives of the evaluation. These objectives are: (1) the future net cash realization to the present recipients of oil income without regard to the present worth of money, and without regard to the risks inherent in the evaluation; and (2) the fair mar-

TABLE 2—EVALUATION OF 100 PER CENT WORKING INTEREST IN A HYPOTHETICAL OIL FIELD DENVER-JULESBURG BASIN, COLORADO, AS OF JANUARY 1, 1956
(Accumulative gross oil production, First 6 Years—1,844,930 Bbl.)

1	2	3	4	5	6	7	8	9	10	11	12	13	14
		Est. future oil reserves (bbl.)				Operating expenses less taxes						Est. undiscounted future net cash realization	
Future years	Prod. oil wells	Daily avg. oil prod.	Gross prod.	Net prod.	Value of future net oil reserves	Per well month	Net total	Per net bbl.	Ad val. and prod. taxes	Net operating income	Net investment and (salvage)	Total	Accum.
1	30	598	218,270	190,980	$540,470	$300	$108,000	$0.57	$19,100	$413,370	$(16,000)	$429,370	$429,370
2	28	480	175,200	153,300	433,840	300	100,800	0.66	15,330	317,710	.....	317,710	747,080
3	28	384	140,160	122,640	347,070	300	100,800	0.82	12,270	234,000	(8,000)	242,000	989,080
4	27	305	111,320	97,410	275,670	300	97,200	0.98	9,740	168,730	(16,000)	184,730	1,173,810
5	25	244	89,060	77,930	220,540	300	90,000	1.15	7,790	122,750	(16,000)	138,750	1,312,560
6	23	195	71,170	62,270	176,220	300	82,800	1.33	6,230	87,190	(8,000)	95,190	1,407,750
7	22	155	56,570	49,500	140,080	300	79,200	1.60	4,950	55,930	(16,000)	71,930	1,479,680
8	20	124	45,260	39,600	112,070	300	72,000	1.81	3,960	36,110	(16,000)	52,110	1,531,790
9	18	98	35,770	31,300	88,580	300	64,800	2.07	3,130	20,650	(16,000)	36,650	1,568,440
10	16	78	28,470	24,910	70,500	300	57,600	2.31	2,490	10,410	(8,000)	18,410	1,586,850
11	15	68	24,820	21,720	61,470	300	54,000	2.49	2,170	5,300	(180,000)	185,300	1,772,150
Total future or avg.			996,070	871,560	$2,466,510	$300 (avg.)	$907,200	$1.04 (avg.)	$87,160	$1,472,150	$(300,000)	$1,772,150	.....

ket value of the property as between buyer and seller, or the value upon which estate and gift taxes are based.

Table 2 shows how such information is obtained.

Columns 1, 3, and 4 show the future economic life of the field by years, the daily average oil production rates, and the gross production as obtained from the decline curve reserve estimate. Column 2, number of producing wells, reflects the abandonment rate of wells from year to year.

Column 5, net oil production, is found by multiplying the figures in column 4 by 0.875. It is assumed that the working interest is 87.5 per cent and royalty interests are 12.5 per cent of the total oil production.

Column 6, value of the oil reserve, is obtained by multiplying column 5 by the net price of a barrel of oil. The net price is based on an assumed Mid-Continent schedule of $2.90 per barrel less $0.07 per barrel gathering and pipeline charges, or $2.83 "at the wellhead."

Column 8, total net operating expense, is determined by multiplying column 2 by column 7, an assumed operating expense of $300 per well per month, by the number of months in a year. It may be observed that the figures in column 8 decrease as uneconomic wells are abandoned.

Column 9, per net barrel operating expenses, derived by dividing column 8 by column 5, shows how lifting costs increase with a decline in production. It also illustrates why lifting costs given in current per barrel terms are not satisfactory for long range projections.

Column 10, ad valorem and production taxes, is computed by multiplying column 5 by the assumed tax rate, 10 cents per barrel in this case.

Column 11, net operating income, is obtained by subtracting the sum of columns 8 and 10 from column 6. In addition to total net income of the future oil production, it shows the anticipated payout characteristics of a loan or of a sale price.

Column 12, net investment and salvage, indicates investment in lease development or redevelopment; salvage of lease and well equipment is shown as a net credit by use of brackets. Although no further investment is assumed for this example, $10,000 per well total salvage is given as $8,000 for well equipment at the time a well is abandoned plus an additional $2,000 for surface facilities when the field is abandoned.

Column 13, estimated undiscounted future net cash realization, is the sum of 11 and 12, and indicates the total net worth of future oil income plus the salvage value of the physical assets used for production of the oil. The sum total of all future years shown is useful for establishing the maximum loan potential of a property.

Thus, in the example given, the present recipients of the 100 per cent working interest may expect to realize $1,772,150 from the oil property over a future economic primary life of 11 years.

Present worth . . . For various financial purposes, it is often desirable to know the present worth of the property being evaluated. Although not illustrated here, this information is easily obtained by applying the appropriate discount factor, usually computed at a rate of from 4 to 8 per cent per annum compounded monthly, to the numbers in column 13.

. . . The fair market value derives from the generally recognized principle that in a transaction between a prudent buyer willing and able to buy, and a seller, desirous but not forced to sell, the buyer should recover his investment and make a profit commensurate with the number and character of the risks assumed with purchase of the property, and with the present worth of money.

A fair market value is not a concise number that can be computed mathematically, but rather it is an agreed-upon value between a buyer and seller and varies appreciably with circumstances. In our foregoing example a fully developed property having an established rate of decline naturally presents the least risk to a potential buyer. Recognizing this fact the buyer may be willing to purchase on the basis of receiving $1.00 profit per $1.00 invested, which would make the purchase price $890,000.

He would also examine his investment on the basis of the dollar value of net reserves he is purchasing. The $890,000 purchase price would be equivalent to $1.02 per net barrel of reserves which is consistent with standards existing in the market at this time.

Another consideration is the rate of payout. Column 11, Table 2, indicates that the $890,000 investment would pay out in somewhat less than 3 years, disregarding income-tax considerations. Therefore, from a standpoint of payout, the $890,000 appears to be somewhat low.

The foregoing reasoning suggests that a fair market value for the example property might be in the order of $900,000 to $1,000,000 disregarding secondary-recovery possibilities.

"A realistic reserve estimate is the foundation of an evaluation, and it is the prime responsibility of the reservoir or evaluation engineer to provide such an estimate."

31,105 Miles Of Pipeline Is Score For 1953-55

by A. T. Coumbe and I. F. Avery

DURING 1953-55, 31,105 miles of pipe for transporting crude petroleum and refined products was laid in the United States, a total slightly below that of the prior 3-year period, according to data compiled by the Bureau of Mines, U. S. Department of the Interior.

The added mileage consisted of 22,571 miles of new pipe, representing about 2,163,807 tons of steel, plus 8,534 miles of second-hand pipe, equivalent to about 419,849 additional tons of steel. During the 3-year period, 13,069 miles of pipe was taken up. By January 1, 1956, the nation had 188,540 miles of pipeline, an 11 per cent gain over the 1952 total of 170,504 miles.

The greater use of larger-diameter pipelines indicated in recent surveys has continued, as the mileage for sizes 12 in. and over increased from 13 per cent of the total mileage at the close of 1952 to 16 per cent 3 years later. Crude-oil trunk lines 12 in. and over in diameter gained 24 per cent during 1953-55, and these larger lines represented 30 per cent of the total mileage compared with 25 per cent at the close of 1952.

Furthermore, the mileage for crude-oil lines less than 12 in. in diameter declined 2 per cent and made up only 70 per cent of the 1955 total against 75 per cent in the previous survey. Products lines 8 in. and over increased 43 per cent from 1952 through 1955

(Continued on page 119)

(Tables on pages 117 and 118)

Authors are with U.S.B.M. Reprinted from Bureau of Mines Information Circular 7769.

TABLE 1—MILEAGE OF UNITED STATES PETROLEUM PIPELINES, 1952 AND 1955
(By size of pipe)

	Trunk lines, miles				Gathering lines, miles		Total mileage	
	Crude		Products					
Inches*	1952	1955	1952	1955	1952	1955	1952	1955
2	.....	.....	.....	.....	17,724	17,454	17,724	17,454
3†	1,173	1,189	385	415	10,707	11,843	12,265	13,447
4	3,276	3,319	1,485	1,585	25,449	27,926	30,210	32,830
6‡	11,538	11,612	7,510	8,842	10,379	11,100	29,427	31,554
8§	26,961	25,623	11,631	14,192	3,174	4,061	41,766	43,876
10	13,476	13,453	2,552	4,367	468	556	16,496	18,376
12	9,511	9,250	2,621	4,921	117	549	12,249	14,720
14	354	495	542	947	16	19	912	1,461
16	1,603	2,492	77	708	4	7	1,684	3,207
18	1,423	1,817	433	443	1	1	1,857	2,261
20	2,959	3,713	.....	.....	1	10	2,960	3,723
22	2,345	2,893	.....	.....	.....	.....	2,345	2,893
24	596	1,383	.....	.....	.....	.....	596	1,383
26	13	704	.....	.....	.....	.....	13	704
30	.....	651	.....	.....	.....	.....	.....	651
Total	75,228	78,594	27,236	36,420	68,040	73,526	170,504	188,540

*Data for odd sizes are included in next smaller size. †Includes an insignificant amount of 2-in. pipe in trunk lines. ‡Includes an insignificant amount of 5-in. pipe in trunk lines. §Includes an insignificant amount of 7-in. pipe in trunk lines.

TABLE 2—RECAPITULATION OF ACTIVITY BY PETROLEUM PIPELINE COMPANIES IN THE UNITED STATES, 1952-1955
(Mileage)

			Pipe laid		
State—	Total, 1952	Pipe taken up	Second-hand	New	Total, 1955
Alabama	508	.....	.....	.....	508
Arizona	.....	.....	.....	403	403
Arkansas	1,952	171	114	379	2,274
California	7,137	229	107	814	7,829
Colorado	938	14	137	506	1,567
Connecticut	22	.....	.....	.....	22
Florida	78	.....	.....	.....	78
Georgia	974	.....	.....	.....	974
Idaho	492	.....	.....	79	571
Illinois	10,228	1,061	335	936	10,438
Indiana	3,605	73	23	548	4,103
Iowa	1,976	.....	.....	250	2,226
Kansas	13,542	1,756	751	2,228	14,765
Kentucky	1,451	57	42	36	1,472
Louisiana	5,486	1,082	387	868	5,659
Maine	475	.....	.....	.....	475
Maryland and D. C.	77	.....	.....	.....	77
Massachusetts	257	.....	.....	.....	257
Michigan	2,339	87	110	1,091	3,453
Minnesota	1,381	.....	.....	623	2,004
Mississippi	1,389	19	78	48	1,496
Missouri	6,303	372	295	180	6,406
Montana	817	26	43	1,029	1,863
Nebraska	1,691	424	108	607	1,982
New Hampshire	73	.....	.....	.....	73
New Jersey	377	143	6	98	338
New Mexico	2,630	158	199	593	3,264
New York	1,275	75	96	252	1,548
North Carolina	138	3	.....	81	216
North Dakota	173	4	6	569	744
Ohio	7,724	399	398	420	8,143
Oklahoma	21,279	1,974	1,819	2,198	23,322
Oregon	170	.....	.....	21	191
Pennsylvania	9,979	313	128	296	10,090
Rhode Island	17	.....	6	.....	23
South Carolina	204	.....	.....	.....	204
South Dakota	203	.....	.....	.....	203
Tennessee	263	.....	.....	.....	263
Texas	54,451	4,200	2,879	6,256	59,386
Utah	576	5	1	139	711
Vermont	118	.....	.....	.....	118
Washington	20	.....	.....	240	260
West Virginia	3,928	262	74	9	3,749
Wisconsin	13	.....	.....	131	144
Wyoming	3,775	162	392	643	4,648
Total	170,504	13,069	8,534	22,571	188,540

TABLE 3—ACTIVITY BY PETROLEUM PIPELINE COMPANIES IN THE UNITED STATES, 1952-1955

(By use, size, and mileage of pipe)

Inches*	Gathering lines: New pipe laid	Gathering lines: Secondhand pipe laid	Gathering lines: Pipe taken up	Crude-oil trunk lines: New pipe laid	Crude-oil trunk lines: Secondhand pipe laid	Crude-oil trunk lines: Pipe taken up
2	799	1,122	2,191	....	....	....
3†	1,412	828	1,104	21	17	22
4	3,261	1,757	2,541	165	77	199
6‡	742	517	538	472	150	548
8§	417	708	238	637	545	2,520
10	102	73	87	659	663	1,345
12	321	117	6	622	113	996
14	3	....	....	158	....	17
16	3	....	....	1,121	7	239
18	....	....	....	444	....	50
20	9	....	....	754	....	....
22	....	....	....	548	....	....
24	....	....	....	787	....	....
Over 24	....	....	....	1,342	....	....
Total	7,069	5,122	6,705	7,730	1,572	5,936

Inches*	Products trunk lines: New pipe laid	Products trunk lines: Secondhand pipe laid	Products trunk lines: Pipe taken up	To all pipelines: New pipe laid	To all pipelines: Secondhand pipe laid	To all pipelines: Pipe taken up
2	....	....	....	799	1,122	2,191
3†	29	19	18	1,462	864	1,144
4	108	30	38	3,534	1,864	2,778
6‡	1,276	134	78	2,490	801	1,164
8§	2,045	805	289	3,099	2,058	3,047
10	1,144	672	1	1,905	1,408	1,433
12	2,125	178	3	3,068	408	1,005
14	405	....	....	566	....	17
16	630	2	1	1,754	9	240
18	10	....	....	454	....	50
20	....	....	....	763	....	....
22	....	....	....	548	....	....
24	....	....	....	787	....	....
Over 24	....	....	....	1,342	....	....
Total	7,772	1,840	428	22,571	8,534	13,069

*Data for odd sizes are included in next smaller size. †Includes an insignificant amount of 2-in. pipe in trunk lines. ‡Includes an insignificant amount of 5-in. pipe in trunk lines. §Includes an insignificant amount of 7-in. pipe in trunk lines.

TABLE 4—MILEAGE OF CRUDE-OIL AND NATURAL-GASOLINE GATHERING LINES, AS OF JANUARY 1, 1956

(By size of pipe—inches*)

State—	2	3	4	6†	8‡	10	12	Over 12	Total 1-1-56	Total 1-1-53
Arkansas	212	57	424	109	46	2	....	....	850	774
California	84	186	597	979	466	94	13	1	2,420	2,264
Colorado	36	24	193	136	120	44	5	9	567	196
Illinois	665	1,037	1,444	242	130	41	1	....	3,604	3,415
Indiana	209	339	209	30	2	1	....	....	790	608
Kansas	944	1,524	2,914	792	545	26	103	....	6,848	6,329
Kentucky	581	240	161	45	1	....	....	....	1,028	1,007
Louisiana	331	113	812	495	260	48	59	10	2,128	1,998
Michigan	56	270	471	178	16	3	2	....	996	903
Mississippi	123	28	219	54	29	3	2	12	470	413
Montana	115	244	133	34	26	....	34	....	586	511
Nebraska	....	16	38	75	53	....	....	....	182	80
New Mexico	129	156	1,377	293	142	41	....	....	2,138	1,878
New York	396	131	17	4	....	....	....	....	548	511
North Dakota	....	13	146	24	21	4	....	....	208	64
Ohio	1,641	678	547	188	1	....	....	....	3,055	3,163
Oklahoma	3,162	2,256	4,289	2,237	557	71	233	....	12,805	11,865
Pennsylvania	2,898	830	290	82	1	....	....	....	4,101	4,151
Texas	3,790	2,951	12,903	4,583	1,521	172	93	5	26,018	23,841
Utah	4	11	11	....	....	....	....	....	26	22
West Virginia	2,020	548	327	290	6	1	....	....	3,192	3,371
Wyoming	58	191	360	230	118	5	4	....	966	676
Total 1-1-56	17,454	11,843	27,926	11,100	4,061	556	549	37	73,526	....
Total 1-1-53	17,724	10,707	25,449	10,379	3,174	468	117	22	....	68,040

*Data for odd sizes are included in next smaller size. †Includes an insignificant amount of 5-in. pipe in trunk lines. ‡Includes an insignificant amount of 7-in. pipe in trunk lines.

SAVE MONEY!
UNUSED
6X6 ARMY TRUCKS

2½-ton GMC & International

- From Government Storage!
- Unused and Guaranteed!
- Factory New Condition!
- Reconditioned Trucks also Available!

Save up to $3,000 on one of our unused Army trucks. See for yourself how TWO of our trucks cost you even LESS than *one* new truck.

Compare our Tandem Axle Trucks with front wheel drive, 10 forward speeds, overdrive and new mud and snow tires with similar equipment elsewhere.

Investigate now! . . . There's no obligation . . . and we deliver on approval!

For Specifications, Prices, Delivery Write, Wire or Phone Collect—JAckson 5-7841
MILTON Y. TOOMBS, JR.
Sales Manager

MEMPHIS EQUIPMENT Company
CONSTRUCTION AND AUTOMOTIVE EQUIPMENT AND PARTS
766 SO. THIRD ST. MEMPHIS, TENNESSEE

Write for Bulletin

PIPELINE VENTS AND MARKERS

FLEET-LINE CO.
P. O. BOX 276-B
SHREVEPORT
LOUISIANA

Ray E. DeLaMater
Manufacturers' Export Representative

specializing in
PETROLEUM MACHINERY EXPORT AND SALES

- MATHEY MACHINE WORKS, INC. Well Measuring Units, Measure Meters, Gas Testing Equipment, Reeling Equipment, Pipe Beveling Machines.
- COATING LABORATORIES, INC. Plasticoat, easily applied reflective paint. Lowers sunlight heat to within 1° of shade.

507 Commercial Bldg.
DI 3-6559 • Tulsa, Okla

TABLE 5—MILEAGE OF PRODUCT PIPELINES, AS OF JANUARY 1, 1956

(By size of pipe—inches*)

State—	Under 4	4	6†	8‡	10	12	14	16	18 and over	Total 1-1-56	Total 1-1-53
Alabama	....	72	....	12	....	200	....	....	200	484	484
Arizona	....	....	....	242	....	161	....	....	....	403	....
Arkansas	15	53	36	77	235	246	....	....	....	662	400
California	141	269	380	176	44	217	4	62	....	1,293	1,017
Colorado	....	....	84	234	....	....	....	....	....	318	318
Connecticut	....	....	22	....	....	....	....	....	....	22	22
Florida	....	....	....	78	....	....	....	....	....	78	78
Georgia	....	167	146	343	147	12	147	....	12	974	974
Idaho	....	....	....	492	79	....	....	....	....	571	492
Illinois	1	2	376	1,046	376	180	267	....	....	2,248	1,815
Indiana	....	2	31	796	107	96	13	67	....	1,112	871
Iowa	7	2	823	498	121	671	....	....	....	2,122	1,872
Kansas	....	167	802	1,584	381	588	....	....	....	3,522	2,698
Kentucky	....	....	10	....	....	....	....	....	....	10	10
Louisiana	....	59	75	192	173	79	....	166	55	799	616
Maine	....	....	324	....	....	....	....	....	....	324	324
Maryland and D. C.	....	....	77	....	....	....	....	....	....	77	77
Massachusetts	....	23	230	4	....	....	....	....	....	257	§257
Michigan	....	10	227	224	123	65	....	226	....	875	438
Minnesota	....	....	444	405	129	291	....	....	....	1,269	1,098
Mississippi	....	....	....	....	....	166	....	....	166	332	332
Missouri	....	....	14	1,108	483	350	....	....	....	1,955	1,505
Montana	....	4	....	234	....	440	....	....	....	678	....
Nebraska	....	....	616	297	....	189	....	....	....	1,102	758
New Jersey	1	....	....	66	....	7	....	134	1	209	248
New Mexico	....	....	132	257	....	....	....	....	....	389	....
New York	1	17	349	179	96	3	77	....	....	722	536
North Carolina	....	....	....	....	108	....	108	....	....	216	138
North Dakota	....	2	127	6	206	....	....	....	....	341	81
Ohio	3	53	846	969	103	1	....	....	9	1,984	1,331
Oklahoma	....	205	734	1,007	390	306	114	....	....	2,756	1,539
Oregon	....	....	61	130	....	....	....	....	....	191	170
Pennsylvania	82	116	1,002	1,138	218	166	114	28	....	2,864	2,725
Rhode Island	4	6	13	....	....	....	....	....	....	23	17
South Carolina	....	....	....	....	102	....	102	....	....	204	204
South Dakota	....	....	129	52	....	22	....	....	....	203	203
Tennessee	....	....	5	104	....	....	....	....	....	109	109
Texas	160	355	664	1,369	727	425	1	25	....	3,726	2,742
Utah	....	1	6	295	5	....	....	....	....	307	277
Washington	....	....	39	143	14	....	....	....	....	196	20
West Virginia	....	....	7	....	....	....	....	....	....	7	7
Wisconsin	....	....	....	....	....	40	....	....	....	40	....
Wyoming	....	....	11	435	....	....	....	....	....	446	433
Total 1-1-56	415	1,585	8,842	14,192	4,367	4,921	947	708	443	36,420	....
Total 1-1-53	385	1,485	§7,510	11,631	2,552	2,621	542	77	433	....	27,236

*Data for odd sizes are included in next smaller size. †Includes an insignificant amount of 5-in. pipe in trunk lines. ‡Includes an insignificant amount of 7-in. pipe in trunk lines. §Revised.

TABLE 6—CUBIC CAPACITY (PIPELINE FILL) FOR PETROLEUM PIPELINES IN THE UNITED STATES, 1952 AND 1955

(Thousands barrels)

State—	Gathering lines 1952	Gathering lines 1955	Crude-oil trunk lines 1952	Crude-oil trunk lines 1955	Total crude lines 1952	Total crude lines 1955	Produce lines 1952	Produce lines 1955
Alabama	....	....	24	24	24	24	490	490
Arizona	....	....	....	....	....	....	....	198
Arkansas	76	78	712	724	788	802	155	340
California	411	452	1,787	1,884	2,198	2,336	197	425
Colorado	32	122	192	589	224	711	92	93
Connecticut	....	....	....	....	....	....	4	4
Florida	....	....	....	....	....	....	26	26
Georgia	....	....	....	....	....	....	405	405
Idaho	....	....	....	....	....	....	162	202
Illinois	284	294	3,658	3,866	3,942	4,160	712	1,007
Indiana	36	45	1,229	1,284	1,265	1,329	308	494
Iowa	....	....	90	90	90	90	716	873
Kansas	649	742	2,455	3,671	3,104	4,413	982	1,311
Kentucky	43	44	591	591	634	635	2	2
Louisiana	248	342	1,908	2,249	2,156	2,591	318	538
Maine	....	....	193	197	193	197	60	60
Maryland and D. C.	....	....	....	....	....	....	14	14
Massachusetts	....	....	....	....	....	....	31	45
Michigan	85	93	229	2,763	314	2,856	123	525
Minnesota	....	....	470	1,476	470	1,476	371	496
Mississippi	50	57	684	696	734	753	399	399
Missouri	....	....	4,671	4,513	4,671	4,513	618	873
Montana	34	64	86	315	120	379	....	402
Nebraska	13	35	1,231	1,148	1,244	1,183	247	351
New Hampshire	....	....	86	86	86	86	....	....
New Jersey	....	....	24	24	24	24	130	205
New Mexico	188	245	320	323	508	568	....	108
New York	16	16	46	58	62	74	121	252
North Carolina	....	....	....	....	....	....	84	164
North Dakota	8	26	47	230	55	256	27	131
Ohio	148	145	1,662	1,618	1,810	1,763	322	547
Oklahoma	1,087	1,325	4,658	4,744	5,745	6,069	524	1,025
Oregon	....	....	....	....	....	....	50	54
Pennsylvania	136	136	576	584	712	720	825	960
Rhode Island	....	....	....	....	....	....	3	3
South Carolina	....	....	....	....	....	....	155	155
South Dakota	....	....	....	....	....	....	41	57
Tennessee	....	....	382	382	382	382	35	35
Texas	2,441	2,780	13,966	18,664	16,407	21,444	882	1,329
Utah	1	2	119	171	120	173	91	101
Vermont	....	....	142	142	142	142	....	....
Washington	....	....	....	116	....	116	4	125
West Virginia	157	150	97	97	254	247	1	1
Wisconsin	....	....	22	442	22	442	....	30
Wyoming	102	127	1,407	1,962	1,509	2,089	141	145
Total	6,245	7,320	43,764	55,723	50,009	63,043	9,868	15,000

TABLE 7—MILEAGE OF CRUDE TRUNK LINES, AS OF JANUARY 1, 1956

(By size of pipe—inches*)

State—	Under 4	4	6†	8‡	10	12	14	16	18	20	22	24	Over 24	Total 1-1-56	Total 1-1-53
Alabama							24							24	24
Arkansas	6	62	167	221	8					298				762	778
California	18	91	542	1,914	920	330	99	20	173	9				4,116	3,856
Colorado	2	2	85	3	350	65			110		65			682	424
Illinois	12	174	278	1,009	960	1,111	25	52	236	330	394	3	2	4,586	4,998
Indiana	11	32	197	1,035	498	214	14	8	12		180			2,201	2,126
Iowa				20	2	65		1		16				104	104
Kansas	196	291	747	1,219	420	389	5	11	227	400	123	367		4,395	4,515
Kentucky	80	97	25							4	228			434	434
Louisiana	11	361	446	654	65	449		153	22	232	339			2,732	2,872
Maine						73			72			3	3	151	151
Michigan	5	160	408	434	17	8				8			542	1,582	998
Minnesota								260	283				192	735	283
Mississippi	6	65	36	153	165	13	64			4	188			694	644
Missouri	1	2	3	815	1,152	1,283	1	39		641	380	133	1	4,451	4,798
Montana	43	72	139	13	108	125		99						599	306
Nebraska		19	27	53	51	39				452	57			698	853
New Hampshire						38			35					73	73
New Jersey			126	3										129	129
New Mexico		91	59	369	83	23	98	5		9				737	752
New York	26	40	124	84		4								278	228
North Dakota				1	8	60		95	28				3	195	28
Ohio	32	20	422	1,695	296	383	2	1		117	122		14	3,104	3,230
Oklahoma	85	567	1,175	2,814	1,261	742		448	46	164	140	316	3	7,761	7,875
Pennsylvania	411	180	1,976	553	3	2								3,125	3,103
Tennessee											154			154	154
Texas	156	817	3,702	11,131	6,683	3,307	101	883	501	774	522	561	504	29,642	27,868
Utah		1	23	81	273									378	277
Vermont						59			59					118	118
Washington								20		44				64	
West Virginia	70	1	451	24	3	1								550	550
Wisconsin									13				91	104	13
Wyoming	18	174	454	1,325	127	467	62	397		211	1			3,236	2,666
Total 1-1-56	1,189	3,319	11,612	25,623	13,453	9,250	495	2,492	1,817	3,713	2,893	2,383	1,355	78,594	
Total 1-1-53	1,173	3,276	11,538	26,961	13,476	9,511	354	1,603	1,423	2,959	2,345	596	13		75,228

*Data for odd sizes are included in next smaller size. †Includes an insignificant amount of 5-in. pipe in trunk lines. ‡Includes an significant amount of 7-in. pipe in trunk lines.

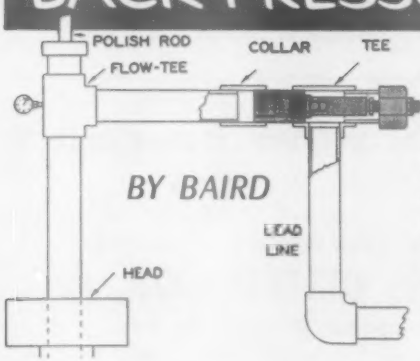
and composed 70 per cent of the total mileage compared with 66 per cent in 1952.

The pipeline fill of 63,043,000 bbl. for crude-oil trunk and gathering lines represented 24 per cent of the crude petroleum held in storage on December 31, 1955, compared with an 18 per cent share at the close of 1952, while the fill for the product lines of 15,000,000 bbl. at the end of 1955 equaled 5 per cent of the stocks of major light products—motor fuel, kerosine, and distillate fuel oils—compared with 4 per cent of the inventory for these same products at the close of 1952.

The fact that the pipeline fill for the crude-oil lines increased 26 per cent during 1953-55 and the fill for the product lines was up 52 per cent reflects the larger average size of pipes used.

BACK-PRESSURE REGULATOR

"Wherever there's oil you'll find Baird products on the job."



Keeps pressure on tubing strings.

For wells that head up and flow, back pressure on the tubing tends to keep the tubing full which prevents stuffing box trouble and increases pump efficiency. By maintaining a back pressure on the tubing, this regulator keeps gas from breaking out of the solution and thus helps to prevent paraffin formation.

ALWAYS AVAILABLE THROUGH YOUR SUPPLY STORE

Baird

MANUFACTURING COMPANY

P. O. Box 350

Tulsa, Oklahoma

NOW!

Freedom from pumping failure!

SELF-PRIMING

Important announcement to pump users! Here is a pump that never fails, never quits. Solids do not foul this pump. This new Gorman-Rupp design has *straight-in* suction. Pumped liquid enters direct to the eye of the impeller—increased capacity, higher efficiency, higher lift. Simpler. Fewer parts. Now available in sizes 1½", 2" and 3".

You saw it in action at the Road Show

GORMAN-RUPP

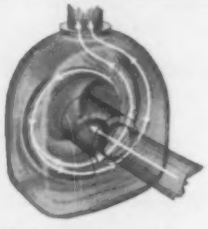
New "80 Series" Pumps

PUMP AT REST

Captured liquid retained for priming. Note the absence of the usual check valve.

PRIMING ACTION

Entrained air (B) escapes at (A) to be discharged. Priming liquid returns (C) to entrain more air.



PUMPING ACTION

Straight-in suction voids entrance restrictions. Water enters direct to eye of impeller.

CHECK THESE NEW-DESIGN FEATURES!

- Straight-in suction
- No check valve
- Lighter in weight
- Long-life mechanical shaft seal

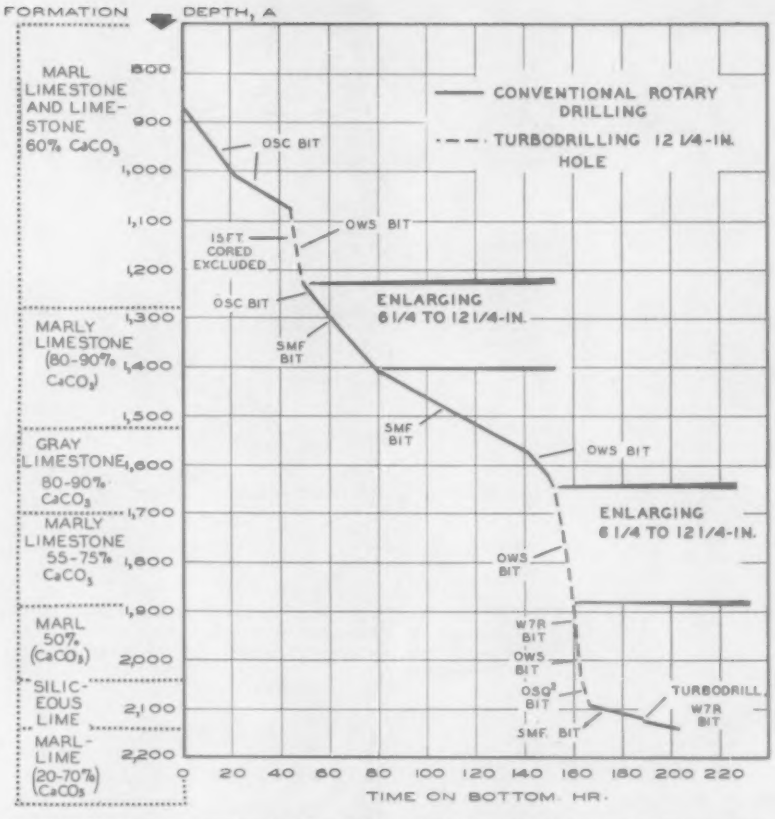
THE GORMAN-RUPP COMPANY

305 Bowman Street • Mansfield, Ohio

Mid-Continent & Gulf Coast Oilfield Representative

HENRY H. PARIS DISTRIBUTOR, INC.

1125 Rothwell Street, Houston, Texas



COMPARISON of conventional drilling and turbodrilling shows the turbodrill increasing rates from 3 to 6 ft. per hour to 30 to 50 ft. per hour. Only 11,000 lb. bit weight and 80 r.p.m. were used conventionally while the turbodrill averaged 27,500 lb. bit weight at 750 r.p.m. Fig. 1.

What Those French Turbodrill Tests Show

Bit weight and rotational speed had equal effect in increasing drilling rates in a limestone formation.

by J. O. Scott
District Editor

TESTS of the Neyrpic turbodrill in France early in 1956, show rates of penetration averaging six times higher than those obtained with conventional rotary drilling. The increase in penetration was attributable to two factors —great weight on the bit and higher rate of rotation. The effect of these two factors are:

- Penetration rate was directly proportional to weight on the bit. This was not determined directly for the slow rotational speeds of conventional drilling but was verified at the rate of rotation of about 750 r.p.m.—the average speed of the turbodrill.
- Penetration rate changed as a fractional power of the rate of rotation—this exponent being from 0.40 to 0.54. Turbodrill rotational speed ranged from 8 to 10 times that of the conventional rotary.

Location of tests . . . Reported tests were in a well in southern France near Montpellier. Total depth was slightly more than 3,000 ft. Comparisons of the turbodrill and conventional drilling in which operational conditions were recorded were made in the interval from about 800 to 2,100 ft.

Formations penetrated were considered to be fairly hard. They consisted of marl, marly limestone, and limestone with compositions ranging from 40 to 90 per cent calcium carbonate. The marl classification is used in the European sense, meaning a compact, impure limestone. Fig. 1 shows the classifications of the formations.

Equipment used . . . The rotary rig used for drilling was an Ideal 50 with two 260-hp. engines. One 7½ by 14-in. pump operated from the compound and another of the same size was powered by a separate 415-hp. engine. For turbodrilling, another pump driven by 660 hp. was added. Total available hydraulic horsepower was 1,160.

The 10-in. Neyrpic turbodrills used are designed to operate at about 750 r.p.m. with a flow rate of 700 to 800 g.p.m. Developed power with these conditions is about 200 to 300 hp. To obtain this flow rate at a minimum pressure drop, 6⅝-in. drill pipe was used.

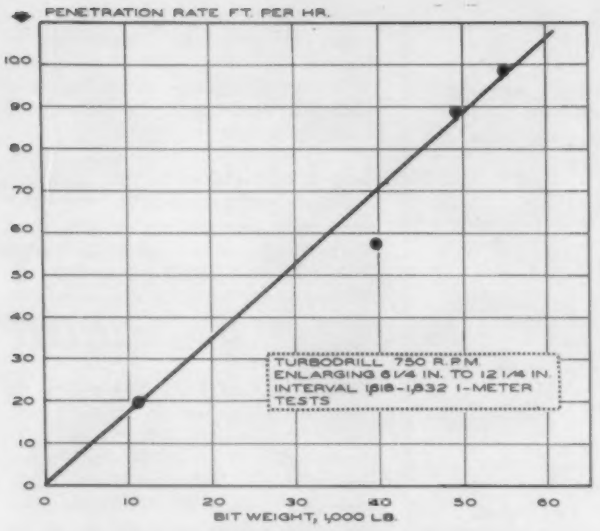
Drilling conditions . . . Comparative tests were made in a 12¼-in. hole. As Fig. 1 shows, a portion of the test interval was cored with a 6¼-in. bit, then enlarged to 12¼ in.

Rotary tests were made with a rotary speed of 80 r.p.m., with bit weights of 8,800 to 11,000 lb., and with a circulation rate of 210 to 400 g.p.m. Circulation rate with the turbodrill varied from 630 to 850 g.p.m. and bit weight was varied from 11,000 to 55,000 lb. With these conditions rotational speed may vary from 600 to 800 r.p.m. Pressures developed during turbodrilling varied from 1,150 to 1,800 psi.

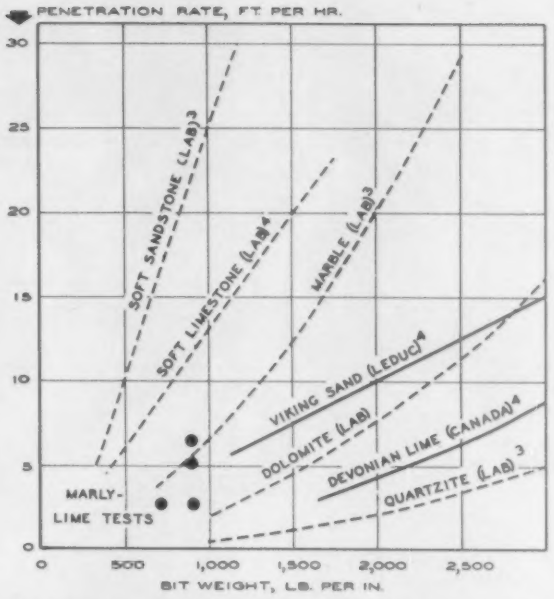
Results . . . Table 1 is a breakdown of footage, time, weight on the bit, and rotational speed over the interval of drilling shown in Fig. 1. Times represent periods during which the bit was actually on bottom.

Rotational speed of the turbine was not actually measured, but the operational conditions indicate that it was held fairly constant. Assuming designed conditions were met with about 33,000 lb. weight on the bit and 710 g.p.m. circulation, a reduction in weight would require less circulation and an increase would require more to maintain the same rotational speed. Table 1 shows that this compensation usually was made.

While Table 1 shows a variance of



LINEAR RELATIONSHIP between drilling rate and weight on the bit was established at turbodrill speeds. Rates here are much higher than average turbodrilling rates. Fig. 2.



CONVENTIONAL RATES in the limestones drilled correspond to those obtainable in Viking sand drilling in Canada. Field drilling rates of formations are depressed considerably below rates obtainable in the lab. Fig. 3.

weight on the bit with the turbodrill, it shows only the average rate of penetration for the different loads used over an interval. To test the effect of bit weight, a series of measurements over 1-m. (3.28 ft.) increment were made in the interval from 1,618 to 1,832 ft. The results of these tests are shown in Fig. 2.

During these tests, bit weight ranged from 11,000 to 55,000 lb. Circulation rate changed accordingly fom 635 to 790 r.p.m. so rotational rate was fairly constant. Circulation pressure varied from 1,420 to 1,780 psi. The tests were made in drilling out 6¼-in. core hole to 12¼ in. but according to the penetrational rates shown in Table 1 for this interval and the succeeding full-hole interval, the hole enlarging was just as hard digging as drilling new hole.

Effect of weight . . . As Fig. 2 shows, rate of penetration in this particular limestone formation is directly proportional to weight on the bit at the rotational rate of 750 r.p.m. The bit used was an OWS (Hughes) which is used in this country for medium-abrasive to hard-nonabrasive formations.

Except for soft or medium-hard formations, penetration rate is usually not directly proportional to weight on the bit for conventional drilling.[1 2 3 4] Curves taken from the above-mentioned references show that the rate of change of penetration rate with bit weight increases as bit-weight increases, especially for harder formations. Fig. 3 shows some typical curves for rotary speeds from 60 to 150 r.p.m.

Sample data from the French tests shown on Fig. 3 correspond roughly to the field-drilling rates from the Viking sand and Devonian limestone formations in Canada.[4] Notice that the Viking sand curve shows proportionality between rate and weight. Very likely the limestone in the French tests would behave somewhat similarly with an increase of weight. These field penetration rates are depressed considerably below the lab rates for similar type of formations which is probably due to the effect of hydrostatic head.[3 5]

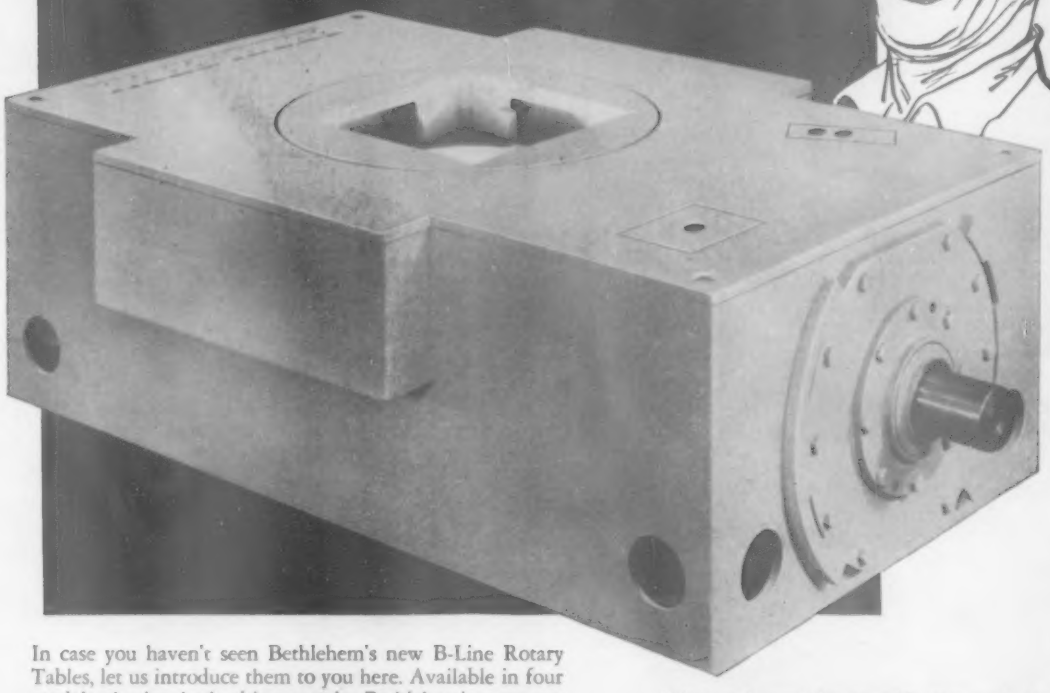
Effect of rotary speed . . . The variation of both bit weight and rotational speed in the French tests makes it necessary to apply a bit-weight correction

TABLE 1—BIT WEIGHTS—PENETRATION RATES

Depth, ft.	Method—	Bit weight, lb.	Rotary speed, r.p.m.	Circ. rate, g.p.m.	Footage	Time (hr.)	Rate, ft. per hr.	Rate at 11,000 lb., ft. per hr.
866-1,014	Conventional	11,000	80	400	148	22.75	6.50	6.50
1,014-1,068	Conventional	8,800	80	400	54	19.75	2.74	3.43
†1,068-1,229	Turbine	17,600	*750	635	146	7.00	20.9	13.9
1,229-1,406	Conventional—reaming 6¼ to 12¼ in.	11,000	80	265	177	30.00	5.90	5.90
1,406-1,573	Conventional	11,000	80	211	167	62.00	2.69	2.69
1,573-1,618	Conventional	11,000	80	635	45	8.75	5.14	5.14
1,618-1,644	Turbine	13,200-26,400	*750	660-690	26	2.25	11.1	9.25
1,644-1,832	Turbine—reaming 6¼ to 12¼ in.	22,000-55,000	*750	685-790	188	5.75	32.7	10.9
1,832-1,885	Turbine—reaming 6¼ to 12¼ in.	33,000-39,600	*750	710	53	2.00	26.5	8.03
1,891-1,967	Turbine	39,600-55,000	*750	660-845	76	1.50	50.7	11.9
1,967-2,032	Turbine	39,600	*750	660	65	2.00	32.5	9.03
2,032-2,097	Turbine	33,000	*750	660	29	3.50	8.29	2.76
2,097-2,110	Conventional	8,800	80	. . .	13	13.75	.95	1.19
2,110-2,111	Turbine	17,600-22,000	*750	635	1	.50	2.00	.99
2,111-2,118	Conventional	8,800	80	. . .	6.6	7.75	.85	1.06
2,118-2,127	Turbine	39,600	*750	710	9	.75	12.00	3.33
2,127-2,139	Conventional	8,800	80	. . .	11.6	13.00	.89	1.11

*Assumed that turbodrill operated at designed rate of 750 r.p.m. Increasing bit weight increases torque and increases the circulation rate required to maintain this speed. †15 ft. cored.

Biggest, Strongest, Sturdiest ROTARIES Bethlehem's Ever Built!



In case you haven't seen Bethlehem's new B-Line Rotary Tables, let us introduce them to you here. Available in four models, they're the huskiest rotaries Bethlehem's ever produced. They include features that assure top performance under the most trying conditions encountered anywhere.

Here are a few of the points that make these rotaries standout performers:

- Cartridge-type pinion-shaft assembly (includes shaft, bearings, bearing housing, and pinion, removable as a unit)
- Oil-bath lubrication throughout
- New-style lock that imposes no load on the gear teeth
- API master bushing furnished in all four models
- Fabricated steel frame with cast-steel housing supporting main bearing

These five big features are by no means the only ones. Others include spiral bevel gears, overhanging sprocket, labyrinth mud seal, ball-type main bearing, and hold-down ring that is adjustable from the outside. Combined, they mean a rotary that is durable, unusually smooth at all speeds, and easy and economical to maintain.

We're so confident of your reaction to the new B-Line rotaries that we invite the very closest inspection. We'd like you to go over them with a fine-tooth comb, inside and out. Ask to see the units that best fit your needs.

B-Line Rotaries — a Size and Capacity for Every Rig

MODEL →	B-175*	B-175L	B-210*	B-275*
Rated dead load, tons	250	250	325	432
Max. input hp @ 200 rpm	288	288	368	425
Type of gears	Spiral bevel	Spiral bevel	Spiral bevel	Spiral bevel
Max. table opening, in.	17½	17½	21	27½
Center of table to center of drive sprocket, in.	44	53¼	53¼	53¼
Length overall, in.	79⅛	89 1/16	91 1/16	93 1/16

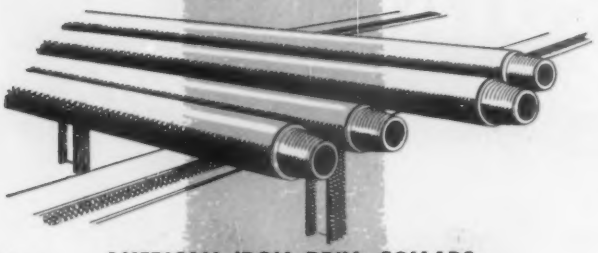
*Also available as skid-mounted Hydrodrive unit with independent engine and torque-converter drive

BETHLEHEM SUPPLY COMPANY
General Offices: 21 E. Second St., Tulsa, Okla.
West Coast Headquarters: Los Angeles, Calif.
Export Distributor: Bethlehem Steel Export Corporation
25 Broadway, New York, N. Y.

BETHLEHEM STEEL

BETHLEHEM SUPPLY

For Quality Products...
BUY THROUGH YOUR SUPPLY STORE

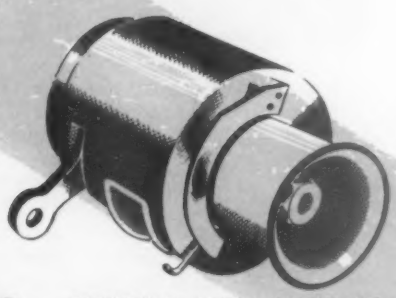


AMERICAN IRON DRILL COLLARS
Regular and Rol-Flex

AMERICAN IRON
STANDPIPE & MANIFOLD FITTINGS
Welded and Screw-on Type

AMERICAN IRON TOOL JOINTS
Straight Grip, Flash Welded,
Amweld, Tubing

AMERICAN IRON VALVES & SEATS
Regular and Hydra-Cushion



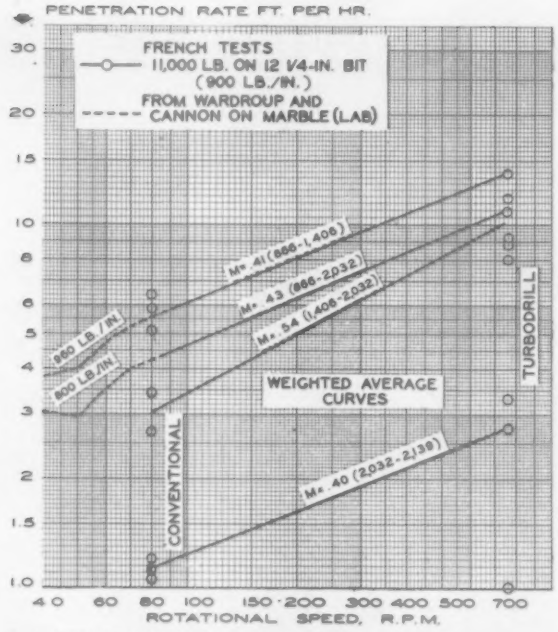
AMERICAN IRON CATHEADS
Universal Model 55,
Friction Catheads
Makeup and Breakout

AMERICAN IRON
PRECISION FORGED STEEL KELLYS
Hexagonal and Square

Another AMF Product
PETROLEUM EQUIPMENT

AMERICAN IRON & MACHINE WORKS COMPANY, INC.
518 North Indiana Avenue • Oklahoma City, Oklahoma
Subsidiary of AMERICAN MACHINE & FOUNDRY COMPANY

AMERICAN IRON & MACHINE WORKS CO. INC.
MANUFACTURERS OF OILFIELD EQUIPMENT
A
OKLAHOMA CITY



WEIGHT-CORRECTED drilling rates show that drilling rate was proportional to the square root of rotational speed. A similar relation has been found in lab tests on marble. Fig. 4.

to the penetration rates before the effect of rotational speed can be studied. As Fig. 2 shows, penetration rate and weight are proportional at the turbodrill speeds and proportionality may be assumed at the conventional rotary speeds.

Field tests reported by Bielstein and Cannon[2] in soft Gulf Coast formations indicate that penetration rate is not proportional to rotational speed. Over the range of 50 to 200 r.p.m., they noted linearity between penetration rate and rotational speed but penetration rate changed half as fast as rotational speed. A close examination of their data shows it also may be approximated by curves where the penetration rate is proportional to the square root of rotational speed. This suggests the curves will be linear on a log-log plot.

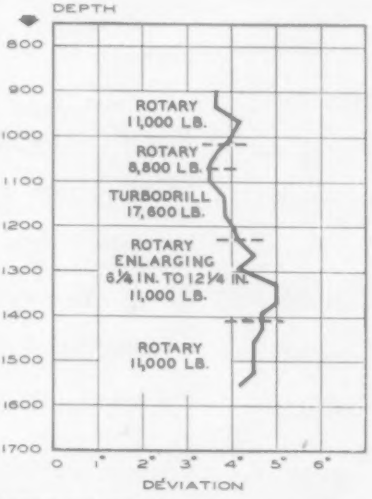
Fig. 4 shows a log-log plot of the French turbodrill data with penetration rate corrected to the bit weight on the conventional drill. For comparison, several of the curves of Wardroup and Cannon[5] for microbits drilling marble are shown. These curves show that penetration rate is proportional to roughly the square root of rotational speed, the exponential power being 0.40 to 0.54 for the French tests.

For the more drillable formation the combined effect of greater weight and higher rotational speed of the turbodrill increased average penetration rate by 6.5. This factor is the product of 2.5 (the effect of increased bit weight) and 2.6 (the effect of the increased rotational speed).

Hole deviation . . . Provided penetration rate is proportional to bit weight for all the formations drilled, the bit-weight factor indicates that an average of 2.5 times as much weight was carried on the bit during turbodrilling as during conventional drilling. This would be about 27,500 lb. However, some data were obtained to show the use of increased weight did not increase hole deviation.

Fig. 5 compares the deviation during conventional drilling with deviation during turbodrilling. The bit weight was 8,800 and 11,000 lb. during conventional drilling and was 17,600 lb. for turbodrilling. With conventional drilling at a weight of 11,000 lb., deviation sought the level of about 4°. The angle decreased somewhat at 8,800 lb. and built back up to about 4° for turbodrilling with 17,600 lb.

Here is a possible explanation: The Neyrpic turbodrill will create a hydraulic thrust of about 37,000 lb. with a flow rate of 710 g.p.m. This weight can be put on the bit while the full drilling string is in tension. As long as this amount of bit weight is sufficient there is no need for drill collars to add weight. With the full string in tension it tends to hang as a pendulum, so that the bit will drill vertically.



MORE BIT WEIGHT with the same deviation was applied with the turbodrill than with a conventional drill string. Fig. 5.

Any bending of the turbine would cause the bit to deviate from vertical in a similar way that buckling of drill collars does. Bending of the turbine is possible because the bit load is applied to the turbine shaft which would tend to buckle. It is restricted from doing so because it is supported by the turbine casing and also because it is relatively short. Present turbines probably behave as rather rigid columns.

Even though the turbine might bend somewhat because of a high load on the rotor, its 10-in. diameter in a 12¼-in. hole would restrict the amount of bending and thus the bit deviation. Unfortunately, the size of drill collars used for the conventional drilling was not reported. If they were somewhat less than 10 in. in diameter this could explain why greater weight could be carried with the turbodrill without increasing hole deviation.

Future use . . . The French turbodrill tests show a definite advantage for drilling medium-hard formations even if just the increased rotary speed were the most important factor. If the ability to use more weight without increasing deviation is real, the advantages of the turbodrill in even harder formations are even greater. As Fig. 3 shows, the harder, more abrasive formations show the greatest response to increasing bit weight at the high bit weights.

If the increase in penetration with bit weight had followed a curve such as that of marble on Fig. 3 rather than being proportional to weight, average penetration rate would have increased by a factor of 14 with the turbodrill rather than a factor of 6.5.

In harder formations, bit wear with turbodrilling might be a serious problem. However, in the French tests, turbodrill bits made as much footage as, or even more than, the bits used at the lower rotational speeds. Two wornout bits used at 80 r.p.m. made 197 ft. (OSC) and 151 (SMF). One bit (OWS) that had drilled 45 ft. at 80 r.p.m. made an additional 188 ft. turbodrilling for a total of 233 ft. Another bit (OWS) made 146 ft. turbodrilling and was still in good condition when pulled.

References

1. Scott, F. L., "Hard-Rock Rotary Drilling," The Oil and Gas Journal, Oct. 5, 1946.
2. Bielstein, W. J., and Cannon, G. E., "Rate of Penetration of Rock Bits," The Oil and Gas Journal, March 30, 1950.
3. Woods, H. B., "Modern Drilling" (three parts), The Oil and Gas Journal, Aug. 23, 1954, Sept. 6, 1954, Sept. 13, 1954.
4. Booth, W. M., "Weight on Bit and Rotary Speed," Petroleum Engineer, April 1955.
5. Wardroup, W. R., and Cannon, G. E., "How to Increase Your Drilling Rates," The Oil and Gas Journal, April 30, 1956.

AZTEC—the New Name in Pumping Units

Built to Out-Perform the Best—

Before designing the new line of Aztec pumping units, we studied the requirements of a large number of oil producers. As a result, Aztec units combine *many important field-proven features* with the latest design principles developed through our own extensive manufacturing experience. Aztec units conform to API specifications and are built in the industry's newest, most up-to-date manufacturing plant.

Aztec units available NOW in sizes up to 7,000 pounds API polished rod load capacity. Larger units are coming soon.

Rapid expansion of the new line of Aztec units will soon make available a complete range of sizes. Your favorite supply store will gladly furnish you with information and prices on Aztec pumping units.

See the new Aztec pumping unit at your favorite supply store soon.

Compare it, try it, and prove it's your best pumping unit buy.

FLOYD HUBERT, *President*, leads an experienced design, production, and sales staff at Aztec. He has been associated with the pumping unit business since 1942.

RUE HESTAND, *Executive Vice President*, has been designing and supervising production of pumping units and other oil field equipment for nineteen years.

FRED BARNUM, *Sales Manager*, brings twenty years experience in the petroleum equipment business to Aztec.

- **Rigidly braced, four-legged Samson Post**
- **Saddle and equalizer bearings are bronze bushings**
- **Arc type hanger can be vertically aligned after unit is set**
- **Reducer with heat treated alloy steel herringbone gears and pinions**
- **All roller bearings designed for over 100,000 hours B 10 life**

2901 WEST PAFFORD STREET

P. O. BOX 11427

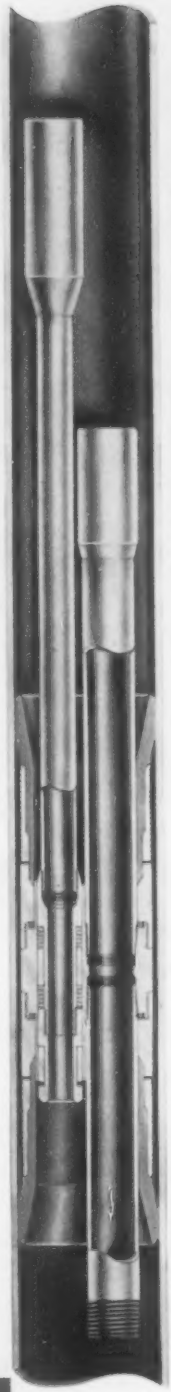
FORT WORTH, TEXAS

AZTEC

MANUFACTURING CO.

Always first

With the Best in Completion and Production Tools



For twenty-five years Brown Oil Tools has produced the completion and production equipment the petroleum industry needs. As new needs arise Brown research is with, or ahead of, the industry in development and testing of the equipment that will do the job and do it right.

The tools shown above – The Duo-Pak Packer – The Bridging Plug Packer – The RS 1B – The Dual String Packer – The SOS J-7 – The Casing Patch Tool – The Mechanical Set Packer – The Boll Weevil Liner Hanger – The Zone Selector – are representative of the Brown line of tools. Each tool was developed to meet a particular need for the industry.

If you want the very best in production and completion tools – Call Brown Oil Tools.

BROWN OIL TOOLS, INC.
2214 CAMPBELL ST.
HOUSTON, TEXAS

Brown Service Locations | TEXAS: Corpus Christi, Kilgore, Snyder, Victoria, Wichita Falls. OKLAHOMA: Ardmore, Oklahoma City. LOUISIANA: Harvey, Houma, Lake Charles, Monroe, New Iberia, New Orleans, Shreveport.

JOB IMPROVEMENT FOR THE PROCESS FOREMAN—78

Temperature Difference Affects Heat Exchange

SIMILARLY, in fractionators hot vapors from one tray pass to the tray above upon which liquid is held at a lower temperature. As the vapor bubbles through the liquid on this tray, portions of the liquid evaporate by absorbing heat from the warm vapors. In having heat removed, portions of the incoming vapors then condense and become liquid on that tray. This process continues up the tower until vapors from the top tray pass through the overhead line to the condensers and are condensed by indirect transfer on the surface of the overhead condenser tubes.

Cooling tower . . . To follow the mechanism of direct heat exchange, consider a cooling tower. The cooling medium used in cooling towers is air. The amount of moisture that air can absorb varies with its temperature and increases greatly with a rise in temperature.

The function of a cooling tower is to bring air and water into intimate contact so that the water will be cooled by the air. This cooling or interchange of heat is accomplished by convection and evaporation. In a tower, convection is taking place between the air and the water. Heat is also being dissipated through evaporation.

For any liquid to evaporate, it must gain heat from some source. The relatively dry air is becoming ladened with moisture from the evaporating water. The water that is now vapor has taken heat from the liquid water and, in turn, reduced the temperature of the liquid.

To this point, the basic principles of heat exchange have been explained. The factors that effect the transfer of heat energy and ways the influence of thermal resistance can be reduced have been established. Also, the yardstick by which heat energy is measured has been defined, and it has been established that heat can be interchanged directly between fluids at different temperature levels, or indirectly through the use of a heat transfer surface.

In the study of heat exchange and the design of heat-transfer equipment there must be a means of evaluating the performance of a given exchanger just as the performance of your automobile is evaluated by determining the amount of fuel required to travel a given distance.

In heat-transfer work, this evaluation factor is called the over-all heat-transfer coefficient and indicates the amount of heat an exchanger can interchange during a given period of time for a given amount of surface with a given temperature difference between the hot and cold fluids.

In engineering practice, this value is referred to as "U" and the unit of measure is B.t.u. per hour per square foot of surface per degree Fahrenheit temperature difference (B.t.u./hour/ft.^{2}/°F).

It has been determined that temperature difference is an influencing factor in heat exchange. In the design of heat-exchange equipment, the difference is called the mean-temperature difference and is calculated from the inlet and outlet temperatures of the fluids entering and leaving the exchanger.

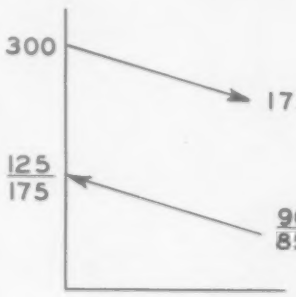
The unit of heat measurement has been established as the B.t.u. For any substance, a given number of B.t.u.'s is required in order to raise the temperature of 1 lb. of the material, 1° F. This is known as the specific heat of the material. The specific heat of several materials are shown below:

SPECIFIC HEAT

Material—	Temp., °F.*	Specific heat, B.t.u./lb./°F.
Gasoline	150	0.54
Water	60	1
Gas oil	320	0.57
Tar	250	0.52
Paraffin distillate	400	0.64
Mobilheat	385	0.635

*Specific heat changes slightly with temperature.

	HOT FLUID	COLD FLUID
INLET TEMPERATURE, °F.	300	90
OUTLET TEMPERATURE, °F.	175	125



DIFFERENTIAL TEMPERATURE = $\frac{GTD+LTD}{2}$

GTD = GREATEST TEMP. DIFF.
LTD = LEAST TEMP. DIFF.

DIFF. TEMP. = $\frac{175+85}{2}$ - 130° F.

EXAMPLE showing how mean-temperature difference is calculated.

TYPICAL HEAT-TRANSFER COEFFICIENTS

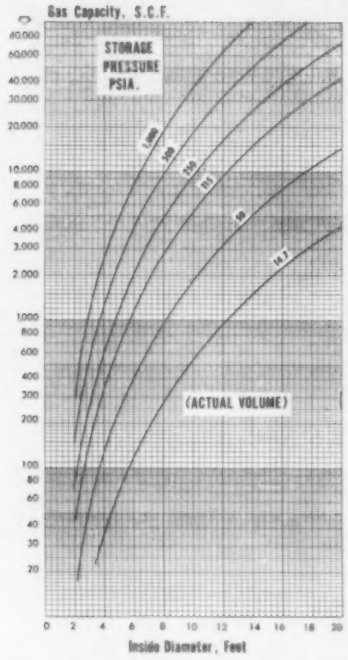
	Tube side		Shell side		
Service—	Fluid	Velocity	Fluid	Viscosity	"U" value
Gas oil cooler	Water	2 ft. per second	Gas oil	3 ft. per second	50-70
Gas oil cooler	Water	2 ft. per second	Gas oil	6 ft. per second	120
Gasoline condenser	Water	5 ft. per second	Gasoline	(condensing)	90
Gaso. vapor to crude	Crude	2 ft. per second	Gasoline	(condensing)	20-30
Lube oil cooler	Water	2 ft. per second	Lube oil	0.2	15
Fuel oil cooler	Water		Fuel oil		30
Gasoline cooler	Water		Gasoline		110

This material is taken from "Fundamentals of Refining," operating manual of Magnolia Petroleum Co., refining division, Beaumont, Tex.

by Dave Vondy
Constructive Engineering Co.

SPHERICAL PROCESS VESSELS—6

How to Calculate Spherical-Tank Capacity



CAPACITY for spherical storage tank (gas). Fig. 3.

THE capacity of a sphere having a diameter of 100 units is given in Table 1. Values of volume are shown to usual accuracy over 100 divisions. For example, if a tank is 80 in. in diameter and contains a liquid to a level of 50 in. from the bottom:

$$(50/80)\ 100 = 62.5 \text{ units}$$

From the table, for a factor of 62.5 the volume is 358,000 units and the tank is:

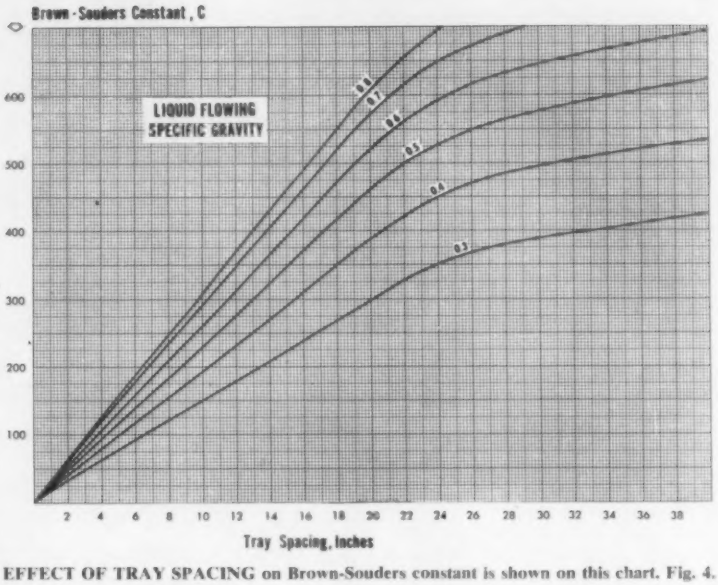
$$100\ \frac{358{,}000}{524{,}000} = 68.3 \text{ per cent full, or}$$

since the volume varies as the radius (or diameter) cubed, the liquid volume contained is:

$$358{,}000\ (40/50)^3 = 183{,}000 \text{ cu. in.,}$$

$$= 792 \text{ gal.}$$

Fig. 3 gives spherical storage-tank capacity (gas). This plot of storage capacity is useful in selecting vessels for surge-tank or gas-storage service. An ideal gas was assumed for the plot to avoid confusion. In an example use of the chart, an air system requires 60 s.c.f. per minute of air at 25 psig.



EFFECT OF TRAY SPACING on Brown-Souders constant is shown on this chart. Fig. 4.

Surge capacity is required for 2 hours' operation to permit maintenance of an air compressor. Thus storage of 7,200 s.c.f. is neded plus the dead volume at 25 psig. The corrected volume becomes:

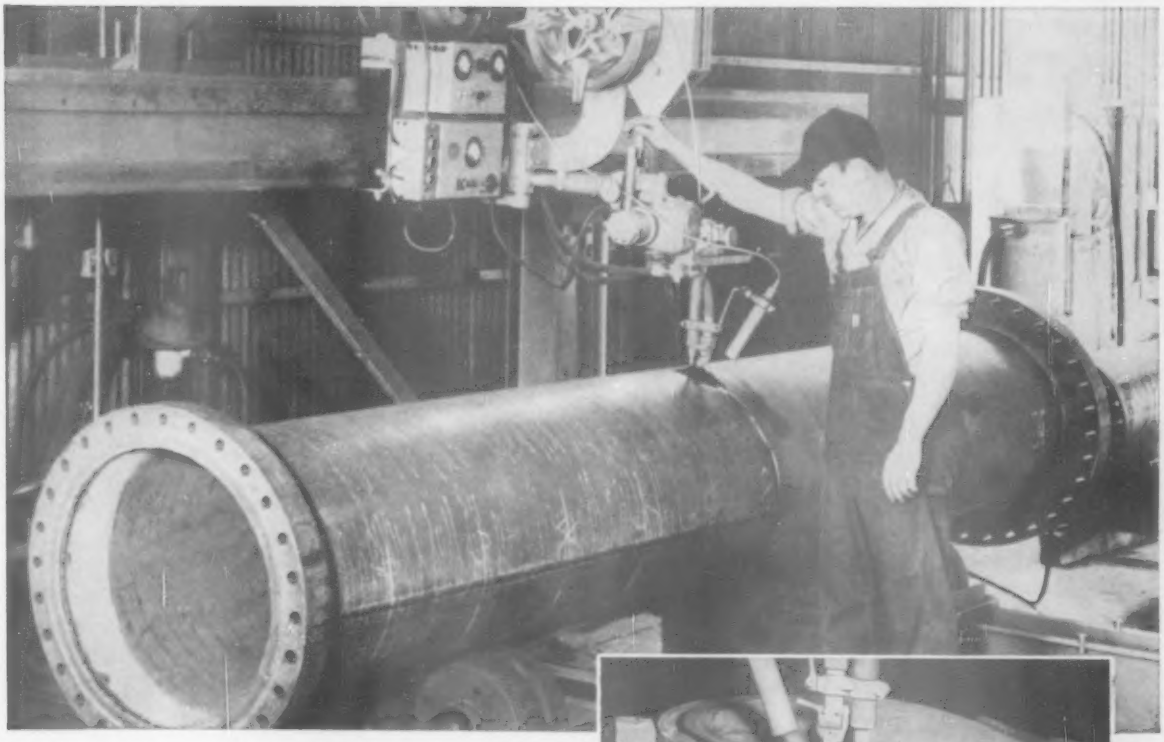
$$7{,}200\ \frac{264.7}{264.7 - 39.7} = 8{,}500 \text{ s.c.f.}$$

and a 9.6-ft. diameter sphere is selected, or if two storage tanks are to be used, they would each have a diameter of 6.1 ft.

Fig. 4 gives effect of tray spacing on Brown-Souders constant.

TABLE 1—CAPACITY OF A SPHERE HAVING A DIAMETER OF 100 UNITS

Height units	Volume units³	Height units	Volume units³	Height units	Volume units³	Height units	Volume units³
1	156	26	87,700	51	270,000	76	448,000
2	619	27	93,900	52	278,000	77	454,000
3	1,380	28	100,100	53	286,000	78	459,000
4	2,450	29	106,400	54	294,000	79	464,000
5	3,790	30	113,000	55	301,000	80	470,000
6	5,430	31	119,600	56	309,000	81	474,000
7	7,340	32	126,400	57	317,000	82	479,000
8	9,510	33	133,300	58	324,000	83	484,000
9	11,950	34	140,300	59	332,000	84	488,000
10	14,670	35	147,300	60	340,000	85	492,000
11	17,580	36	154,600	61	347,000	86	496,000
12	20,800	37	161,800	62	355,000	87	500,000
13	24,300	38	169,300	63	362,000	88	503,000
14	27,900	39	176,600	64	369,000	89	506,000
15	31,800	40	184,300	65	377,000	90	509,000
16	35,900	41	191,800	66	384,000	91	512,000
17	40,200	42	199,400	67	391,000	92	514,000
18	44,800	43	207,000	68	398,000	93	517,000
19	49,600	44	215,000	69	404,000	94	519,000
20	54,400	45	223,000	70	411,000	95	520,000
21	59,500	46	230,000	71	418,000	96	522,000
22	64,900	47	238,000	72	424,000	97	523,000
23	70,200	48	246,000	73	430,000	98	523,000
24	75,900	49	254,000	74	436,000	99	524,000
25	81,800	50	262,000	75	442,000	100	524,000



X-RAY-QUALITY WELDS ...75% FASTER *with* UNIONMELT WELDING

Top-quality welds are a must to assure the maximum service life of parts subject to high pressure and temperature. Like many manufacturers of pressure units, the Western Supply Company, Tulsa, Oklahoma is using UNIONMELT welding to make X-ray-quality welds (in heat exchanger shells) at new high speeds.

*** HIGH SPEED:**

UNIONMELT welding speeds average 15 to 19 in. per min.—this is as much as 75 per cent faster than welding methods previously used. The steel parts welded range from ½ to 3 in. in thickness, and welds are made in from one to three passes.

*** REDUCES GRINDING:**

Since UNIONMELT welding produces smooth, flat weld beads, the need for grinding completed welds has practically been eliminated—further reducing production costs.

UNIONMELT welding is the fast, efficient method of fabricating metals thicker than 18 gage. UNIONMELT welding makes possible increased fabricating speeds and lower production costs. Learn the details—call your local LINDE Representative for more information on UNIONMELT welding, and start saving today.

Linde Air Products Company

A Division of Union Carbide and Carbon Corporation

30 East 42nd Street UCC New York 17, N. Y.

Offices in Other Principal Cities

In Canada: LINDE AIR PRODUCTS COMPANY

Division of Union Carbide Canada Limited, Toronto

The terms "Linde" and "Unionmelt" are registered trade-marks of Union Carbide and Carbon Corporation.

Linde Trade-Mark

WHY HAVE GASO PUMPS BEEN ADOPTED AS STANDARD By So Many Leading Pipeline Companies?

Go over our sales records and you'll be struck by the recurrence of names you recognize as big, successful, ably managed pipeline companies.

Why have so many of these companies adopted a *company policy* of specifying GASO wherever the need is for pumping units?

Because of *experience*. Their own service records have *demonstrated* that GASO Pumps consistently deliver top performance for *longer* periods with *less* upkeep and maintenance. In keeping with modern concepts of management, they insist on maximum value in all purchases . . . and get it in pumps by the simple process of making GASO part of the specifications.

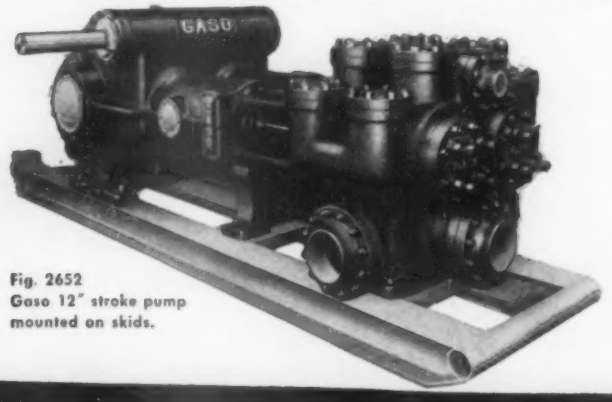


Fig. 2652
Gaso 12" stroke pump mounted on skids.

GASO PUMPS
for every oil industry need

DISTRIBUTORS

W. L. SOMNER COMPANY, Shreveport, Louisiana • Odessa, Texas • Tinsley, Mississippi • Brookhaven, Mississippi

POWER PUMPS, INC., Long Beach, California

PEDDLERS, INC., Houston, Texas

PUMP ENGINEERING CO., Wichita Falls, Texas

LUFKIN FOUNDRY & MACHINE CO. Casper, Wyoming

HAGUE EQUIPMENT CO., INC. Evansville, Indiana

LUFKIN MACHINE CO., Ltd. Edmonton, Alberta

GASO PUMP & BURNER MFG. CO.
TULSA, OKLAHOMA
Export Office: 149 BROADWAY, NEW YORK

How Refinery Size Affects Profit Picture

by W. L. Nelson
Technical Editor

Can you present a complete realization of refinery operations as related to capacity, something like your "Effect of Refinery Capacity on Operating Costs," *(The Oil and Gas Journal, August 6).* **—W.L.B.**

The gross income from refining can be obtained by subtracting the operating cost and the cost of delivered crude oil from the value of the products. However, there are so many variables such as (1) product prices, (2) location and tariffs for crude oil, (3) the influence of the size of the refinery or oil-company organization, (4) kind of crude oil, etc., that only a few illustrations are possible. In all of the discussions that follow, refineries operating under the following conditions (see Figs. 1-3) are considered:

1. Location—Gulf Coast.
2. Venezuelan oils (Bachaquero and Cumarebo) refined in Caribbean at Gulf Coast operating costs with no import duty.
3. Time—year 1946 and January 1956.
4. Gulf Coast cargo low prices (Caribbean prices considered as equal).
5. Investments as shown in Table 1.

TABLE 1—AVERAGE INVESTMENT AND MANPOWER REQUIREMENTS OF REFINERIES.

Capacity, b/d	Organization	—Investment, millions— 1946	1956	Total manpower† per 1,000 bbl.
10,000	Small	$5.0	$9.65	18.8
20,000	Small	8.0	15.4	16.7
30,000	Small	11.2	21.6	15.6
	Large	17.0	32.8	‡28.0
50,000	Small	16.8	32.4	‡13.4
	Large	25.3	48.8	26.2
100,000	Large	44.0	83.0	23.6
300,000	Large	105.0	202.5	19.2

*Nelson Refinery Construction Cost Index, The Oil and Gas Journal, July 7, 1952, page 105, and published in the first issue each month of The Oil and Gas Journal, and each year in the Engineering News Record Construction Cost issue.

†Refinery Manpower, Questions on Tech., The Oil and Gas Journal, September 24, page 157.

‡One large refiner operating a small (38,000-bbl. per day) plant required 31.6 men per 1,000 bbl., whereas a small refiner in a 50,000-bbl. per day plant used only 5 men.

Investments . . . The costs of average complete refineries equipped to produce primarily gasoline and fuels are indicated in Table 1, as well as average manpower requirements. Higher investment costs were used for the plants in which corrosion was severe or in which a large amount of cracking was conducted (West Texas and Bachaquero) and a lower investment cost for the very light Cumarebo crude oil. Such adjustments for the small-refiner plants ranged from minus 30 per cent for Cumarebo to plus 21.5 per cent for West Texas (but only minus 7.6 to plus 11.1 per cent for large-refiner plants). Similar but smaller adjustments were made in the manpower requirements.

Product realizations and crude costs . . . The yields and product realizations of the four crude oils are indicated in Table 2. United States market demand was visualized for the East and West Texas crude oils but world demand (a lower product realization) was considered for the two Venezuelan oils. The product yields and realizations are based on those employed extensively by the author of this page and they are for world market demand. Accordingly, for United States market demands, the product realizations (and yields) for East and West Texas crude oils were increased by 5 per cent for major refiners and by 2 per cent for small refin-

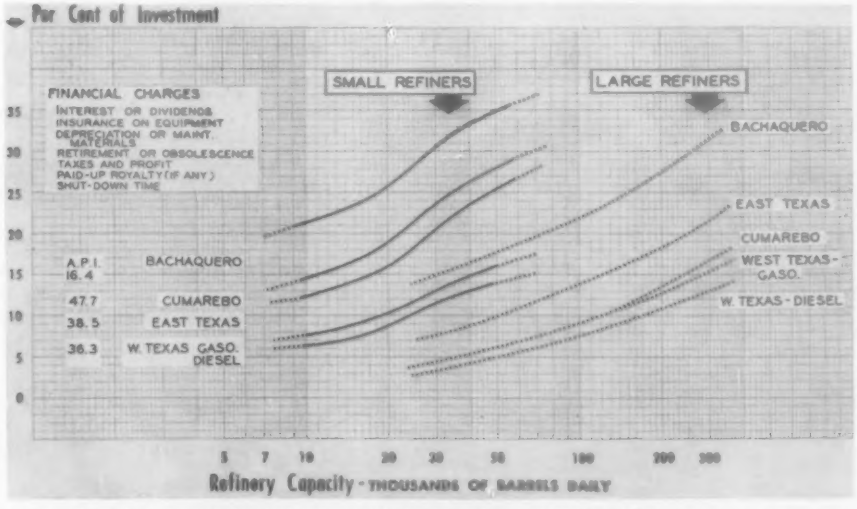


Fig. 1—Gross income available for all financial charges when Gulf Coast refineries operate on four types of crude oils—January 1956.

pre-assembled VACUUM TANK

Ready to Mount on Your Truck

SELF-CONTAINED MODEL WT is made with capacities of 35, 40, 45, 50 and 55 bbls. Comes complete, ready for work. Has its own gasoline engine, pump and 4-way valve.

THOMPSON, the originators of the unitized vacuum tank, now makes available this self-contained model WT. It's factory-readied for you to mount on any CA 120" truck in your own shops. Put the WT on your truck in the morning; put it to work after lunch!

WRITE FOR SPECIFICATIONS, complete with blue-printed mounting instructions. If you'd like to see a Thompson Unitized Vacuum Tank at work, we'll tell you where, in your own area, you can watch it save time and money — pay for itself time and time again. Write today.

FOR SUPER-FAST CLEANING OF:

- CRUDE TANKS
- DRAIN BOXES
- RUN-DOWN TANKS
- SEPARATOR BOXES
- CAUSTIC TANKS
- DRAIN LINES
- CATALYST SLURRY
- And a hundred other field, refinery and pipeline chores.

THOMPSON TANK and MANUFACTURING CO. Inc.
2019 EAST WARDLOW RD. LONG BEACH 7, CALIFORNIA

SOLE LICENSEE TO MANUFACTURE VACUUM TANKS UNDER U. S. PATENT No. 2522077

MUD MIKE says:

So you got time to act like an executive now that PALCOTAN keeps mud working right!

In controlling viscosity, gel strength and water loss, *Palcotan* takes a lot of strain off everybody from the rig to the front office. Mud Mike isn't the only one who's discovered that it not only costs less, but is particularly effective at low concentration.

P.S.: PALCO SEAL is the ideal companion product, too, for control of circulation losses.

Write for details

Available through oil field and mud service organizations

THE PACIFIC LUMBER COMPANY
100 Bush Street, San Francisco 4, California

RADIOACTIVE

Serving These Industries . . .

electronics
chemicals
petroleum
nucleonics
aircraft

nucor

Tracers and Sources for the Oil Industry

May be used for:

- LOGGING
- RADIOGRAPHY
- LEVEL GAGING
- DENSITY GAGING
- CATALYST ATTRITION
- MIXING EFFICIENCY
- REACTION CATALYST
- PRODUCT RESEARCH
- FLOW TRACING AND MEASUREMENT

Our facilities and personnel are at your disposal for assistance on these and other radioisotope uses in the petroleum industry.

Write Today for Complete Brochure to Dept. OJ

ISOTOPES SPEC. CO., INC.
A Subsidiary of Nuclear Corporation of America, Inc.
703 S. Main St.
Burbank, Calif.

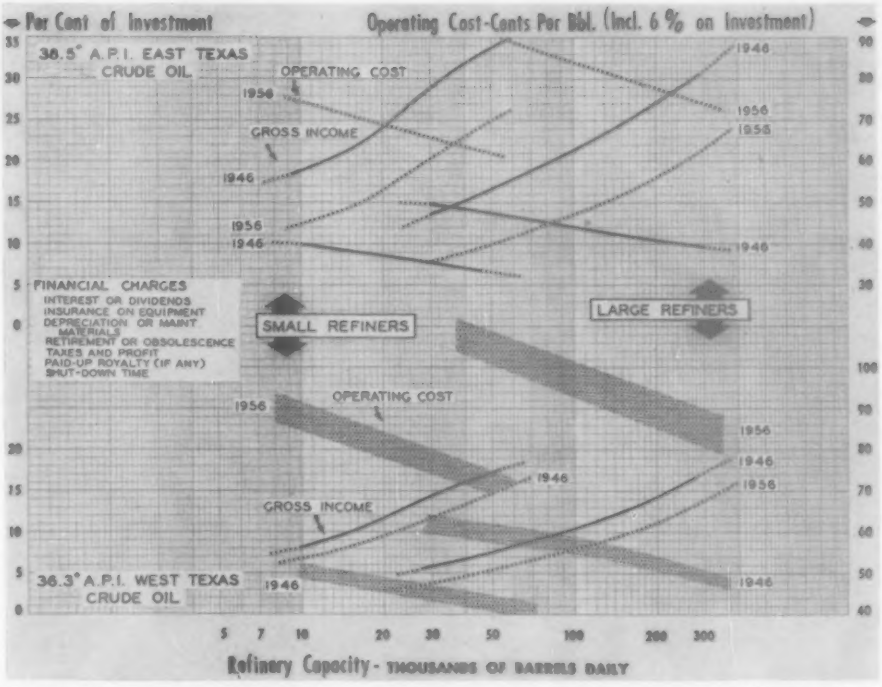


Fig. 2—Gross income available for all financial charges when processing East and West Texas crude oil on the Gulf Coast.

ers. Large refiners have more complete equipment, whereas, small refiners can maintain more flexibility in operations and can adjust yields to the current market. However, small refiners must sometimes allow discounts, whereas large refiners can profit by sale of top-price brand-name products. The net result of all of these factors was thought to be the 5 and 2 per cent adjustment.

Operating costs and gross income . . . The operating costs are those derived in two earlier Questions on Technology *(The Oil and Gas Journal, August 6, page 109)*, "Effect of Refinery Capacity on Operating Cost" *(The Oil and Gas Journal, December 17, page 145)* and "Effect of Reduced Capacity on Refinery Operating Costs." Gross incomes were obtained by subtracting the cost of crude oil and the cost of operation from the gross product realization and the results are shown graphically in Figs. 1 and 2.

Operating costs consist of three major items:

1. Labor costs including insurance, retirement, sickness pay, etc.
   - Supervision and clerical
   - Operating
   - Utility (water, steam, power)
   - Inspection and maintenance
   - Laboratory
   - Any other labor charges
2. Per barrel charges
   - Fuel (process, steam, power)
   - TEL and chemicals
   - Catalysts
   - Water (raw) and treating
   - Neutralizers and inhibitors
   - Royalty (if any)
3. Financial charges
   - Interest on investment, or dividends

TABLE 2—YIELDS AND PRODUCT REALIZATIONS, 1946 AND JANUARY 1956.

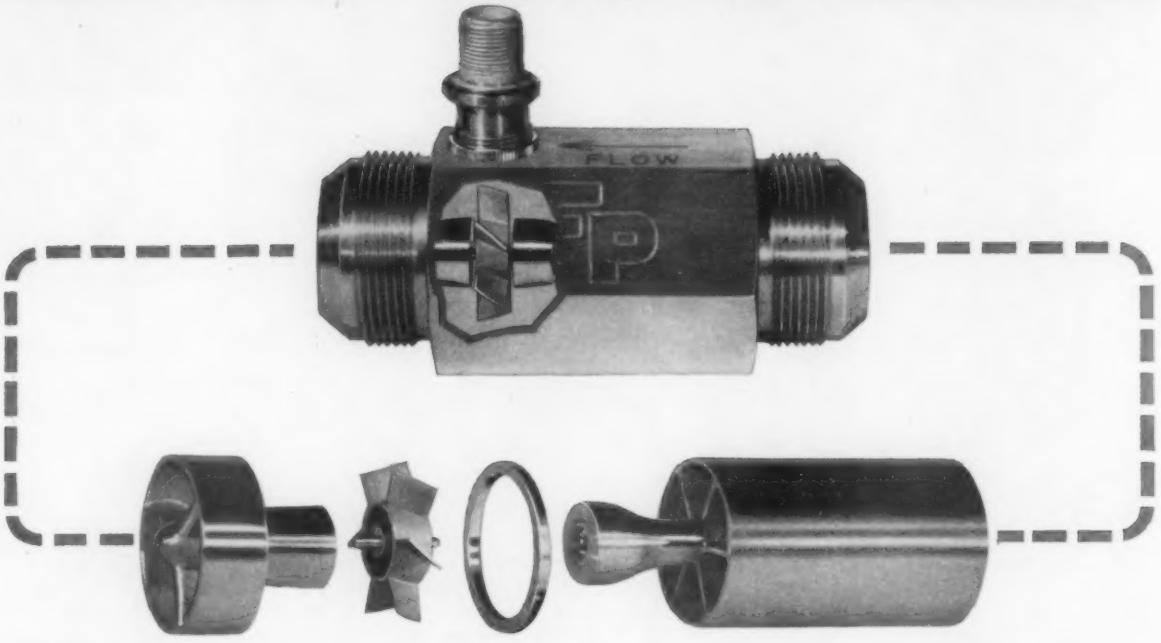
	Bachaquero (Vene.)	West Texas Diesel	West Texas Cracking	East Texas	Cumarebo (Vene.)
A.P.I. gravity	16.4	36.3	36.3	38.2	47.7
Per cent sulfur	2.02	1.31	(sour)	0.33	0.07
*Cracked, percentage	31.6	15.8	29.0	29.8	20.5
Standard Yields—					
Loss	2.4	1.4	1.8	3.2	3.0
Gasoline	26.4	41.0	54.2	51.5	61.7
Kerosine or No. 1				13.6	13.0
Disel fuel		33.7			
No. 2	10.8		15.0	5.1	7.6
No. 3	5.5	2.8	5.1	5.2	3.6
Wax or lube				3.3	4.8
Bunker C	54.9	21.1	23.9	18.1	6.3
Standard Product Value—					
1946, $/bbl.	$1.62	$1.97	$2.00	$2.09	$2.35
January 1956	2.98	3.70	3.81	3.85	4.35
†Adjusted Realization—					
1946 large, $/bbl.		$2.07	$2.10	$2.19	
1946 small		2.01	2.04	2.13	
January 1956 large	$2.98	3.88	4.00	4.04	$4.35
January 1956 small	2.98	3.78	3.88	3.93	4.35
‡Crude Oil Delivered—					
1946, $/bbl.		$1.48	$1.48	$1.60	
January 1956	$1.90	2.93	2.93	3.06	$3.40

*Gas oil only. Viscosity breaking of residues is also practiced in U.S.A.

†Adjusted upward by 5 per cent for large refiners and 2 per cent for small, as discussed in text.

‡Including gathering and pipeline tariff on Texas oils. No import duty on Venezuelan oils because processed in Caribbean for sale of products to world.

The big difference is inside the NEW F&P TURBINE METER



NOW AVAILABLE TO YOU is the new F&P Turbine Meter—made to the same high standards that has made Fischer & Porter a world leader in flow measurement know-how.

Also from F&P you can secure a complete line of electronic digital and analog readout instruments, associated data handling instrumentation and unsurpassed calibration facilities—making the application of F&P Turbine Meter practical—dependable and easy to integrate into systems operation.

Inherent precision accuracy.

Unaffected by piping or orientation.

Easily disassembled and re-assembled with no shift in calibration.

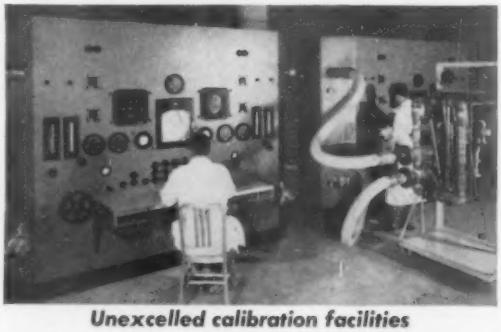
Wide-linear flow range.

Digital output proportional to flow.

Interchangeable calibration factors within size.

Low inertia for excellent transient response.

Write today for complete information on the F&P Turbine Meter. Test it in your own processes and you'll agree that here is a better, sturdier, less costly turbine meter than ever before available. Write to Fischer & Porter Co., 3127 County Line Road, Hatboro, Penna.



Unexcelled calibration facilities

The Colburn Memorial Flow Laboratory at Fischer & Porter, the finest and most modern of its kind in the world, provides the basic standards for flow measurement of all F&P flow meters.

FP FISCHER & PORTER CO. Hatboro, Pa.

COMPLETE PROCESS INSTRUMENTATION

LA1143

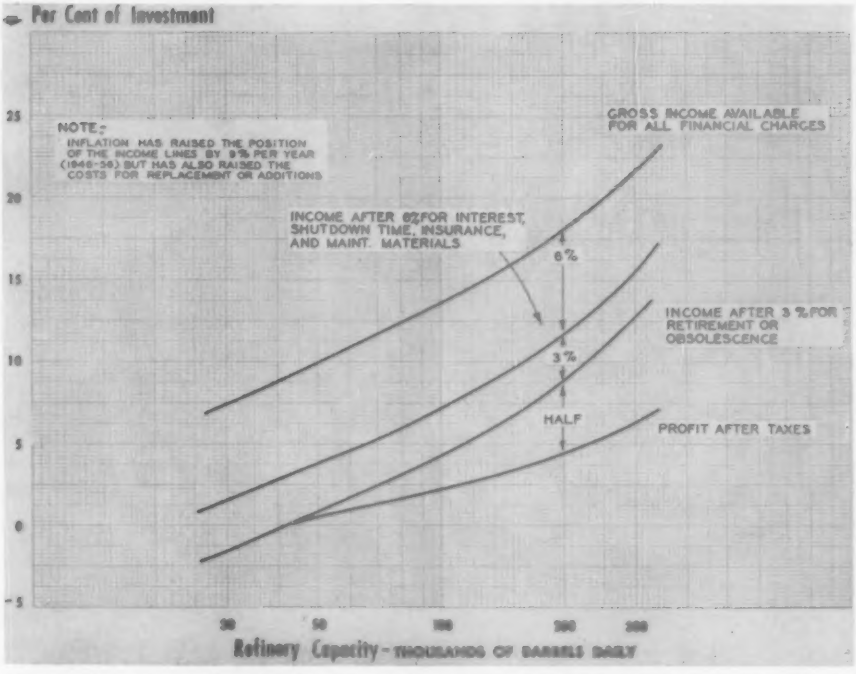

Per Cent of Investment
NOTE:
INFLATION HAS RAISED THE POSITION OF THE INCOME LINES BY 9% PER YEAR (1946-56) BUT HAS ALSO RAISED THE COSTS FOR REPLACEMENT OR ADDITIONS
GROSS INCOME AVAILABLE FOR ALL FINANCIAL CHARGES
INCOME AFTER 6% FOR INTEREST, SHUTDOWN TIME, INSURANCE, AND MAINT. MATERIALS
6%
INCOME AFTER 3 % FOR RETIREMENT OR OBSOLESCENCE
3%
HALF
PROFIT AFTER TAXES
25
20
15
10
5
0
-5
Refinery Capacity - THOUSANDS OF BARRELS DAILY

Fig. 3—Effect of various financial charges on the income derived when East Texas crude oil is processed at a Gulf Coast location by a large refiner—January 1956.

Depreciation (and maintenance materials)

Insurance on equipment and paid-up royalty

Shutdown time

Obsolescence or retirement of investment

Inflation (in one sense a credit)

Taxes and profit

Labor costs and the "per barrel" charges can be handled in a routine way, but much confusion arises as to just how the financial charges should be handled. Accordingly, in Figs. 1 and 2, it was decided to present only the gross income with no deduction whatsoever for financial charges. The manner by which various financial charges can be deducted is indicated in Fig. 3 for East Texas crude oil. Incomes are stated as percentage of investment for ease in comparison. No single factor can be used to convert from "percentage of investment" to actual cents per barrel, but 1 per cent of investment ranges from 0.66 cent per barrel. (50,000-bbl. per day Small-Refiner Plants) to 1.8 cents. (30,000-bbl. per day Large-Refiner Plants) during 1946. During 1956, the cents per barrel for 1 per cent investment is smaller by a divisor of 1.92 (0.34 and 0.95 cents). Similar plots to those of Figs. 1 and 2, but in terms of cents per barrel, do not show as large a variation between the incomes of large and small refiners.

Financial charges were left largely as a lump sum because of the various ways that its items can be considered. Interest on borrowed capital or dividend payments to shareholders must be paid, as must insurance and taxes. However, the other three items, i.e., depreciation, or maintenance; obsolescence or retirement; and inflation are all interlocked with one another.

There is scarcely such an item as depreciation in most refineries because if the refinery is kept in proper working order it is substantially as useful after 10 or 20 years as when new. Thus, depreciation is accounted for in large part by a continuous maintenance-labor expense, repeated inspections, and by the continual purchase of replacement equipment. Of all depreciation costs, only the cost of maintenance materials might be considered as a true financial charge.

Although retirement of an investment may not be necessary, especially during a constant inflation such as that which occurred during 1946-1956, obsolescence cannot be avoided and thus some income must be set aside for additions to or replacement of the refinery. However, inflation in the cost of refinery construction has averaged about 9 per cent per year during the last 10 years (1946-1956) and accordingly refineries have increased in value during 10 years by an amount that will nearly repay the original investment cost.

All of this means that the lines of Fig. 3 can be moved upward because of inflation by an amount of about 9 per cent—that inflation is actually an (dollar) income. However, also note that the cost of replacement or additions is also inflating by an amount of 9 per cent per year.

In summary, it appears that a total financial charge of 7 or 9 per cent of the investment, consisting of 3-4 per cent interest and 2-4 per cent for all other charges except profit and taxes, should be adequate for all conditions except deflation (or depression). Should inflation halt, then management will wish that it had laid aside 4-8 per cent more for additions and replacement of the plant.

It is evident in Figs. 1 and 2 that increase in capacity makes an operation more profitable, but each plant behaves in its own way depending on the crude oil being processed and the type of management. The increase in profitability is nearly uniform for all operations (the slopes of the lines are similar) but the level of profitability ranges widely for various operations.

The apparently poor showing of the large refiners compared with small refiners cannot be interpreted to mean that the large refiners are inefficient. The large refiner has exceptional difficulties that can never be fully overcome. They must deal through committees which is a safe procedure but one which stifles ingenuity, they lack flexibility, they are constantly beset by Government, by labor unions, and by the public, and they must function in a thoroughly organized manner. All this means that great sums are needed to notify themselves of everything that is done or contemplated, followed by endless conferences until all ideas have been thoroughly explored. **End.**

NOT EVEN FIVE FEET OF PEAT BOG CAN HANG UP THE NO. 583

The Cat* No. 583 Pipelayer is not only the highest capacity pipelayer in history—but the most efficient. Mannix Ltd., Calgary, Alberta, has four of them in its 100% Caterpillar spread laying 110 miles of 30-inch gas line through southern British Columbia.

The line takes the No. 583s through 40 miles of reclaimed lake bottom, covered with heavy silt and peat bog four to six feet deep. But the No. 583 has a full 21-inch ground clearance, and the bog can't stop it.

These big yellow units were engineered to give you a full day's work no matter what the terrain. For this machine was designed after consulting spread superintendents, foremen, mechanics and operators throughout the industry. It incorporates all their ideas of the ideal pipelayer. As a result you have the first machine that is *all pipelayer*.

It has 130,000-lb. lifting capacity and its engine delivers 191 HP. There is a three-stage torque converter in the main drive and new hydraulically actuated counterweights. And the extra high bottom clearance of the counterweight pivot, coupled with the ability to retract the counterweights well over the tracks, means that the No. 583 can maneuver easily even while handling an extra heavy load on a narrow right of way.

Here's the safest, fastest, most efficient machine ever designed for pipelaying. Behind it stand an army of Caterpillar Dealers always ready to give you quick service with quality factory parts wherever the pipe takes you. Call your Caterpillar Dealer today. You name the date—and he will demonstrate on *your* job.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR*

*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

WANTED—
THE HARD WORK

Engineer's stake in . . .

Expediting right-of-way

by Frank A. Smith

RIGHT-OF-WAY problems are management problems—not only of the land department and engineer, but also the collective management of all companies who have to buy right-of-way. It is impossible for any one pipeline company to operate without being affected in one way or another by the actions of other companies, and it concerns all companies dealing with right-of-way, because it tends to establish a general hostile attitude that results directly in higher costs, delays, and litigation.

For the past several years we have discussed and resolved problems as they presented themselves during a project according to our best judgment at the time and then promptly forgot them. At a later date when confronted with a like problem we vaguely recall the prior methods applied but generally resolve the problem somewhat differently, thus defeating conformity in policy directive.

It would seem to me, then, that it would be proper to establish a definite, well-outlined policy of procedure. I feel that the problems which will be outlined here have a great deal of similarity wherever encountered. Applying then our past experience and study, a clear and practical standard procedure could be outlined. Each problem would be classified and made to fit into a category and decisions concerning them could in a certain sense be tailor made. With this degree of conformity of procedure all companies would benefit.

As a suggestion, perhaps some technical committee of the Pipe Line Division, American Society of Civil Engineers, and a committee of the American Right-of-Way Association could find this subject of sufficient importance to outline a procedure they would recommend to all companies dealing with rights-of-way.

Initial Steps

Once abstract and land descriptions are in hand, the land department can immediately begin easement preparation and various other legal documents required for its right-of-way acquisition program. Thus, quite frequently, actual acquiring of right-of-way is begun before the preliminary survey is made, or in some cases, the two operations—survey and acquisition—can be carried on together.

The last is most desirous, if at all possible, as it expedites the progress of the survey party.

Contacting landowners . . . At this point, it is now considered a must to contact each landowner and endeavor to secure permission either written or oral, to make the proposed survey across his property. Even though state statutes may not require such a procedure, we all know that the existence of such statutes does not necessarily mean that a survey party will not be stopped by an irate landowner.

To alleviate this condition, we use permit men working under the supervision of the land department to resolve the problem with the individual landowners. This enables the survey party to conduct their work in proper sequence and not suffer unnecessary delays while the party chief explains to a landowner or other interested persons as to who he is and why he is on the land.

It is most desirable to plan to have the right-of-way agent and survey party work in the same areas, because if the agent is successful in buying an easement, the survey party is automatically free to enter the lands. If the easement cannot be secured, then the agent is in the area to make immediate contact for permission to survey, thus reducing overhead expenditures by the use of one man performing two duties as well as eliminating survey progress delay.

Acquisition program . . . By the use of aerial mosaics, a properly organized land department can plan its acquisition program simultaneously throughout an entire project, or, at least, a large segment thereof. This is possible because of the availability of sufficient land ownership data to allow fast preparation of easements for field assignment to the right-of-way agents. The benefit derived therefrom is as follows:

- Immediate acquisition contacts along every area of the project keeping down preliminary rumors not based on the facts.
- Educational factors can be personally directed by the presence of the company's representative to the landowners, interested persons, and civic groups, as to the purpose of the project, its general location, method of construction, and tentative construction schedules.
- Permits early evaluation of the acquisition program.
- Indicates early in the program the acquisition trend.

This information, of course, is of great benefit to the engineer enabling him to plan construction schedules and to negotiate contracts for construction to predetermine points of beginning of construction which will avoid shutdown time due to lack of right-of-way. It also enables him to plan and time all operations to best fit the trends and patterns of the acquisition program as it develops.

Right-of-Way Problems

I would now like to point out the exacting mechanics of rights-of-way problems.

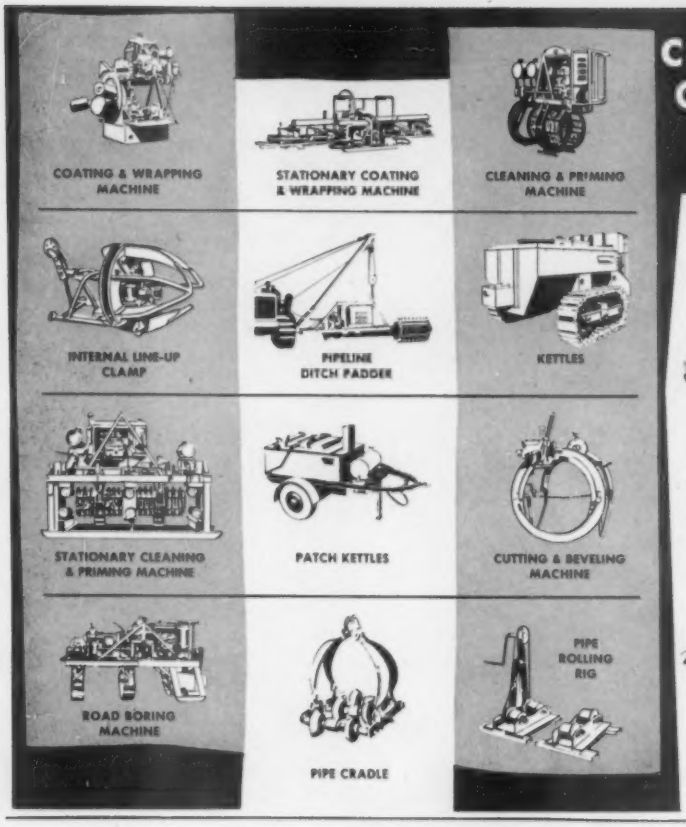
Preliminary survey . . . The engineer usually attempts to organize field forces and survey parties so that alignment survey, crossing surveys, profile survey, and soil-test survey can be carried on simultaneously throughout the project with several parties in the field.

The control of the parties and the assignment of land-department permit men must be directed by the engineer. The engineer should indicate to the land department the location of his parties and keep the land department continually advised. In this manner, the land department can then provide adequate personnel for permitting so that no party is without this service at any time.

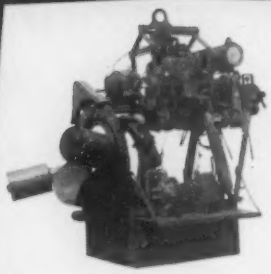
Relocation of pipeline . . . The preliminary traverse of the pipeline is projected on aerial mosaic maps with only an occasional ground reconnaissance made. As the actual preliminary ground survey is made, many problems can be encountered which would require a relocation generally minor in nature but occasionally it is major.

The ground survey might indicate terrain and economic features where it is impractical to construct such as ravines, paralleling cut banks, side hills, common corners, railroad crossings, river crossings, swamps, and marshes. At river crossings and in marshes it is usually necessary that additional right-

Author is right-of-way supervisor, Ford, Bacon & Davis, Inc. Paper presented before the Committee on Pipe Lines, Construction Division, American Society of Civil Engineers, Pittsburgh.



CROSE SPRAY-RING TYPE COATING & WRAPPING MACHINE



The spray-ring applicator makes this Crose machine the finest on the line . . . and more contractors use them!

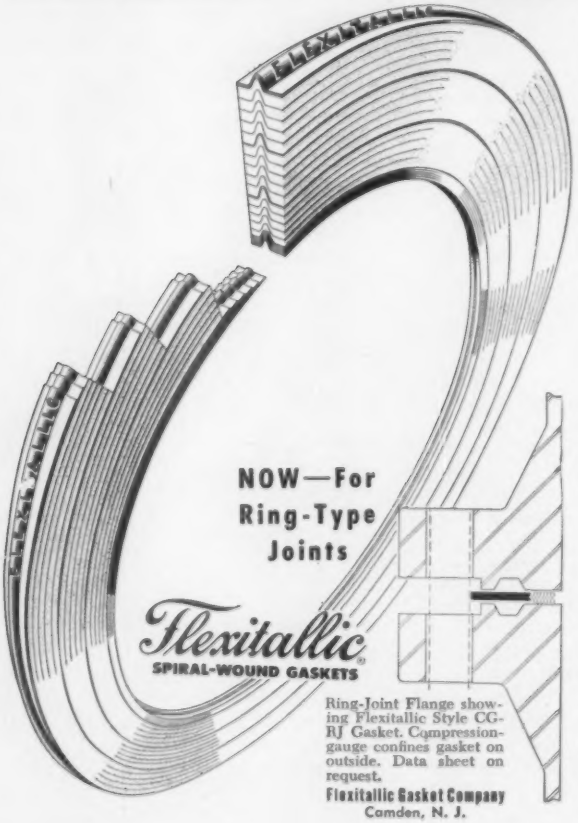
The Crose machine assures uniform coating . . . precision wrapping . . . it coats Bends or "Egged" Pipe.

Available in sizes that handle pipe 2" to 36".

m.j. Crose Manufacturing Company, Inc.

2715 DAWSON ROAD • TULSA, OKLAHOMA • PHONE MAdison 6-2172

New York, N. Y. Ph. BRyant 9-2236 • *Denver, Colorado Ph. EMpire 6-0332
*Houston, Texas Ph. UNderwood 9-3358 • *Newark, N. J. Ph. MArket 4-3650
DISTRIBUTOR: *CROSE-CURRAN LTD. — EDMONTON, ALBERTA — PHONE 3-5135
*Warehouses in 4 locations



Ring-Joint Flange showing Flexitallic Style CG-RJ Gasket. Compression-gauge confines gasket on outside. Data sheet on request.

Flexitallic Gasket Company
Camden, N. J.

Treating every important aspect of HIGH PRESSURE effects in chemical processes and systems

Here is an authoritative treatment covering the entire field of high pressure technology, from process reactions and essential theory to equipment design and industrial and laboratory applications.

– Just Out! –

HIGH PRESSURE TECHNOLOGY

By EDWARD W. COMINGS, Purdue University

548 pages, 312 illustrations, $11.50

HERE is a reliable and thorough guide for chemical engineers and others who work with systems subjected tto elevated pressures, giving a sound working knowledge of the special concepts, methods, and designs necessary to handle these systems.

It supplies important information on metals used in high pressure equipment . . . safety practices . . measuring apparatus . . . stresses and strains . . . effects of pressure on gases and liquids, chemical equilibrium, and chemical engineering operations . . . and many more.

Order now from

READER SERVICE DEPARTMENT

The Oil and Gas Journal, Box 1260, Tulsa, Oklahoma

of-way be acquired for working space. The working space is for the benefit of the contractor and it is generally provided that the working space will revert to the landowners after construction.

The ground survey might also determine an area of subsurface operations or surface structures which must be avoided due to prior rights of individuals or companies engaged in mining operations whereby minerals could not be recovered because of the location of the pipeline.

In cases where right-of-way has already been acquired and a relocation is desired by the engineer, economic consideration must be given to the costs of rights-of-way, the effect on abutting owners, the costs of unrecoverable minerals as compared to shortening or lengthening the line, and the time element involved in renegotiating right-of-way agreements, with exposure to possible additional costs.

Very often a landowner will insist upon a change of the traverse across his property so that the construction and operation of the pipeline will not interfere, or will interfere less, with his future planning or development of the area.

Such relocations often come about because the landowners request that certain trees and shrubs be preserved or a potential subdivision might be contemplated for a portion or all of the area in which case the location would best serve the owners' interest if laid along lot lines.

It is also possible that a portion of the property is devoted to a certain type of cultivation that would not adapt itself to the presence of a pipeline. Ponds, lakes, dams, reforestation projects, drainage systems and the like all can be causes of relocation in order to simplify acquisition.

Defining description . . . In the past few years a defined description as to pipeline location has become the rule and not the exception. In past years, it was quite common to acquire without too much difficulty what was known as an open-end easement in which the traverse of the pipeline was not defined, but merely confined to a legal land description of the landowner's entire property.

However, a combination of reasons has required a center line defined description and many times a plat of the pipeline traverse to be annexed to and made a part of the right-of-way easement and allied instruments. These demands have greatly increased engineering costs in surveying and drafting to develop individual property plats. The requirement for a defined description and plat is a very definite cost factor, and will in my opinion soon be mandatory on every tract of land purchased.

To expedite acquisition, it is necessary for the engineer to provide the land department with a proper acquisition plat adequate to satisfy the landowner or his legal counsel. Then right-of-way agents will not be delayed too long in closing the contract.

Thinking has for many years resolved itself engineeringwise to obtain by right-of-way acquisition as much as possible in the terms of the right-of-way grant so that the engineer may relocate the pipeline on the property without having to resort to renegotiation. Frequent abuse of this practice has now resulted in passing of state laws and regulations that preclude unrestricted use of the open easement.

In my opinion, a defined description works to the betterment of the pipeline company as concerns its future expansion, if any. In an undefined right-of-way, too many assumptions can be drawn as to the width of the right-of-way, causing the location of the pipeline itself to have no general bearing on the bounds of the right-of-way. It also raises many questions and conflicts in title, especially where the land might be proportionally subdivided, then encroachment might be made on the right-of-way assumed to be owned.

That leaves the company no remedy at law. When clearly defined, the rights are established and encroachment is easily determined. This is generally accepted by land departments as being preferable to the so-called open easement.

Special provisions . . . These provisions, granted in easements to secure acquisition, cover a great many factors and have become in late years the rule and not the exception. Here are some of the factors:

- Because of tile or a drainage system on the land, the landowner requires extra depth of cover for the pipeline.
- Quite often the course of traverse of the pipeline conflicts with proposed building sites or a planned subdivision.
- Farm ponds for livestock watering are often in conflict with the course and traverse of the pipeline.
- Provisions are often incorporated in the grant to indicate the type of tile drainage repair.
- Special provisions for gates, fences, repair of fences, and adequate bracing of the fences.
- Livestock control during construction.
- Time limit for construction.
- Close proximity of the pipeline to occupied public buildings and dwellings.
- Provision of land leveling in rice farms where not only the right-of-way area of the pipeline is involved, but the whole cultivated field will be affected by construction.

The economics in these factors should be studied thoroughly so that the cost of right-of-way when the provisions are granted will be no greater than the cost to construct and the several extra bills which might be required to provide for the conditions incorporated in the easement.

Appurtenances . . . Here are the appurtenances to the pipeline involving both the easement and fee-simple ownership:

1. Gate valve, the area required, natural of the installation and its position, extent above the ground, and whether it is to be fenced. This is usually an easement requiring a special plat as to location. This type of easement should be acquired early because of the preference for installing gate valves at the time the line is being built.

2. Side taps. The same is true in this case. This is usually an easement acquisition.

3. Regulators and metering stations. This acquisition is normally a long-time lease of fee acquisition and early definition of the area to be used by the engineer is vitally important to the land department.

4. Cathodic bed protection. This acquisition is generally in the form of an easement and most installations vary somewhat in their areas of construction. They often lie adjacent to the pipeline but not on the pipeline right-of-way. Certain rights must be acquired to install anodes and their connections, as well as right-of-way for the overhead power line.

5. Property for compressor stations and pump sites. The engineering design and yard layout drawings for an acquisition of this type are vitally important to the land department. Additional working space is desired for grading and quite often an access road is indicated.

6. Telephone lines and radio-tower sites. This design, like that for compressor stations and pump sites, should be available to the land department as early as possible.

Frequently sufficient information on these acquisitions is not available to the land and engineering departments until after the project is well under way.

Here's How You Can Save Time & Money inspecting—cleaning—relocating Your Pipe Lines

ALUMIRON COUPLINGS

(both standard and lightweight)

for grooved end pipe

- Cut material and labor costs by using these malleable iron and aluminum couplings on your steel, aluminum, cast iron, wrought iron and spiral weld pipe.
- Pipelines become "portable" when you couple them with Alumiron Couplings—quickly couple or uncouple them by means of two bolts through the coupling halves. A leak proof seal is easily made by pulling up the two half housings with a socket wrench.
- The flexibility of the Coupling corrects for slight piping misalignment and permits the line to adjust to the slope and uneveness of the ground.
- Furnished with Buna N or Neoprene gaskets. Lightweight series pressure to 500 pounds—Standard series to 1000 psi working pressure.
- Stocked in 2, 3, 4, 6 and 8 inch sizes. Other sizes on request.

Write for Literature and Prices. Distributor Inquiries Invited.

CHARLES E. MANNING CO.
4700 Clairton Blvd. Pittsburgh 36, Pa.

an ACCO product

WINCH LINE TAIL CHAIN. is ACCO's Registered Trade Mark

Look for this tag when you buy

- Equip your wire ropes with genuine ACCO Winch Line Tail Chains.* Operators find them unsurpassed for lifting, hauling, loading—in fact, for exacting work of all types.
- The tag reproduced here is attached to every new ACCO Winch Line Tail Chain.* It is your assurance of highest quality, long chain life and dependable performance.

Write our York, Pa., office for Bulletin DH-1021.

*Reg. U.S. Pat. Off.

American Chain Division
AMERICAN CHAIN & CABLE

York, Pa., Atlanta, Boston, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, Portland, Ore., San Francisco, Bridgeport, Conn.

Better Value

PIPELINE PATROL

Progress control . . . The control of progress of acquisition for right-of-way is a must, both for the engineer and the supervisor of the land department. They must know at all times what progress is being made and how it is affecting the construction schedule and cost estimates. It is felt that the weekly progress report is adequate. However, I have found that a daily progress report keeps much better control of assignment of personnel as to the work they have on hand and the necessity of assignment of new work.

A good method of control is that of the graph line whereby the engineer defines a line upon graph paper that fits into his schedule of acquisition, then, if progress fails to reach this line during any given report period, immediate steps can be taken to resolve the matter by adding personnel and/or reconsidering the authorized roddage price on the basis of total cost exposure.

If the actual progress exceeds the estimated graph line, the construction schedule at times can be revised at a cost savings to the company.

This graph line should be substantiated by a progress report from the field showing rods or miles of daily acquisition and total acquisition to date. As you can see, proper administrative decisions can readily be formulated from the study of the foregoing type of control on the basis of the complete facts in hand.

Litigation . . . Primarily all petitions for condemnation must be supported by certain exhibits. These exhibits are generally land plats.

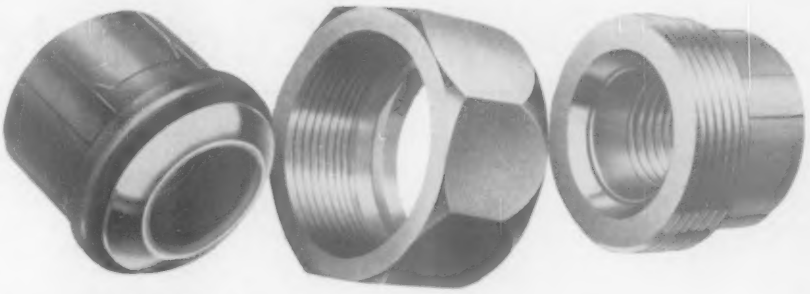
This plat must show the traverse of the pipeline across subject property from the point of entry to point of exit, the course and bearings of the line, the width to be appropriated, and corner ties to define the point of entry and the point of exit and center line description of the right-of-way.

Court Witness

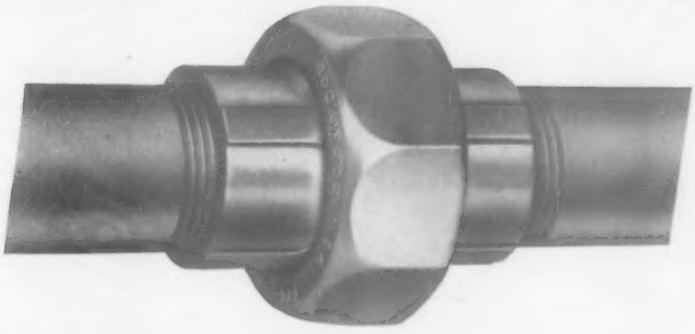
The engineer must prepare himself to testify before the courts as an expert witness touching on the matter of feasibility of location and economics of the location.

He must be ready to give a complete layman's explanation of the plats above mentioned and have a general knowledge of the corporate structure and its rights under certificate of necessity.

Editor's Note . . . The second installment of this article on pipeline right-of-way problems will appear in the February 25 issue of The Oil and Gas Journal.



Because the male seat
is 150 Brinell harder than .....the female seat.....



Rockwood unions will not gall when making up!

HARDNESS DIFFERENTIAL

makes the big difference. This exclusive Rockwood feature means this #603 union will perform better and last longer . . . making a really trouble-free joint.

COMPLETE INTERCHANGEABILITY — Even under difficult working conditions, Rockwood Union #603 gives you superior performance. And each part of the #603 is interchangeable.

EXCLUSIVE "ROCKWOODIZING" — There's another big difference that pays off, too! That's exclusive "Rockwoodizing" process that protects the entire Union including threads, against corrosion. Add these big advantages to the fact that both seats are made of corrosion-resistant AISI molychrome steel, forged in place and bonded-locked under 100,000 and 400,000 pound pressure and you'll know why you can't buy a better Union.

ROCKWOOD SPRINKLER COMPANY

Distributors in all principal industrial areas

GET ALL THE FACTS on the Rockwood Union #603, mail coupon now.

ROCKWOOD

ROCKWOOD SPRINKLER COMPANY
1449 Harlow Street
Worcester 5, Mass.

Please send me prices and further data on the new Rockwood Union #603. I would also like the name of the nearest Rockwood distributor.

Name.....

Title.....

Company.....

City.....Zone..State.....

MAKE 'EM UP TIGHT—
BREAK 'EM OUT EASY

'Bestolife Lead Seal Tool Joint and Casing Compound gives maximum joint make-up, for tight seals—and easy separation of parts, for faster handling without danger to joints. Standard of the oil country for over twenty-five years. Unconditionally guaranteed. Packed in 1¼, 5, 20 and 50 lb. containers. Sold by leading supply houses the world over.

I. H. GRANCELL
1601 E. NADEAU STREET
LOS ANGELES 1, CALIF.

NOW BUYS
MUDWONDER

W. W. "Bill" Sauer of Gabe McCall Drilling Co. now buys Mudwonder Mudline Valves to stop downtime.

Edward Valves, Inc., Subsidiary of Rockwell Manufacturing Company, East Chicago, Ind.

Among the Drilling Contractors

Barge-Rig's Hole Totals 238,423 Ft. in 4 Years

A barge-mounted rig owned by Richardson & Bass, of Dallas, has drilled 19 wells with an aggregate of 238,423 ft. of hole during the 4 years it has been in operation. One well was drilled to 17,867 ft. Two others reached depths below 15,000 ft. Average depth was 12,653 ft.

The barge-rig, "Blind Pass," was designed for wildcatting, and has been used for that purpose in most of its operation. Its first well, drilled late in 1952, was in Corpus Christi Bay, off Nueces County, Texas. That was a dry hole at 11,161 ft. The rig then was moved to South Louisiana, where it has been since.

Drilling depths of the successive wells since the first hole have been, in feet: 14,775, 12,576, 11,047, 9,700, 9,700, 9,700, 9,700, 9,700, 12,503, 9,700, 9,720, 11,610, 12,116, 17,867, 16,360, 11,998, 15,320, and 12,000.

Levingston Shipbuilding Co., Orange, Tex., built the barge. National Supply Co. outfitted it with drilling equipment. The rig centers around a Type 160 draw works, powered by five Superior PTDSG-8 supercharged dual-fuel engines. Engines supply 3,350 hp. Other main equipment includes a Type 760-C crown block, a Type 660-TD traveling block, a Type F hook, a Type MS-27½-in. rotary, two Type E-700 pumps for mud circulation, a Type C-350 pump for mixing and standby purposes, and a 154-ft. Lee C. Moore mast.

In the 17,867-ft. well, 7-in. casing was run to 14,167 ft. The 16,360-ft. well was drilled to total depth with 5-in. drill pipe. In it, 9⅝-in. casing forming an actual casing load of 630,000 lb., was set at 14,101 ft. In the 15,320-ft. well, 9⅝-in. casing was bottomed at 12,088 ft.

Phillips Coastal Division Goes Year Without Injury

Employes of Phillips Petroleum Co.'s Gulf Coast drilling division recently completed 1 year of work without a disabling injury. This represents 390,000 man-hours of work for the crews of five drilling rigs for an entire year and for the crew of another rig which operated in the area for 3 months during the year.

Four of the rigs are drilling in water ranging in depth from 10 to 85 ft. The record was established despite the hazardous working conditions resulting from hurricanes, high seas, and the congested working area on platforms, drilling barges, and drilling tenders. The crew of one of the rigs recently completed 250,000 man-hours of work without a disabling injury.

H. W. Patterson is superintendent of the Gulf Coast drilling division. C. G. Starr is safety supervisor.

Shreveport Group Forms Contract Drilling Firm

McGoldrick & Watson Drilling Co. is a newly formed contracting firm headquartering at Shreveport. It is starting with one Brewster N-3 drilling rig, and will add another in the near future. It is fully equipped to do drilling and workover work at depths from 1,500 to 4,000 ft. Present offices are at 213 Beck Building.

Partners in the firm are E. W. McGoldrick, Kenneth McGoldrick, and J. M. Watson. The elder McGoldrick has been an independent producer in North Louisiana and South Texas for 40 years. He started sa a driller in the Spindletop field, at Beaumont, in Jefferson County, Texas Gulf Coast.

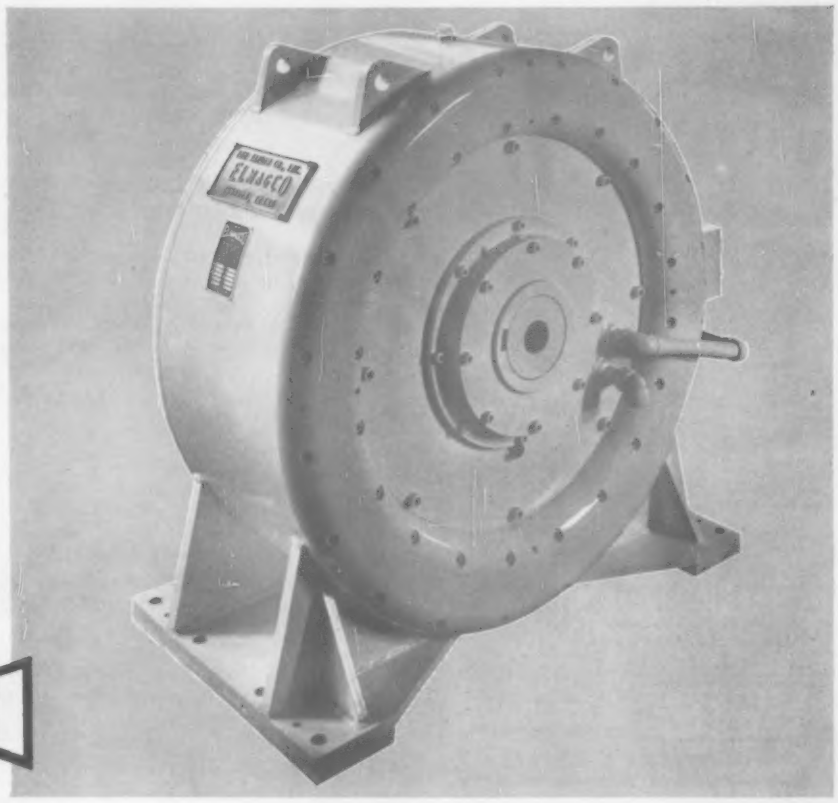
Kenneth McGoldrick, a graduate of the University of Oklahoma, is a consultant petroleum engineer and an independent oil producer, operating McGoldrick Oil Co. Previously, he had been associated with Stanolind Oil & Gas Co. for 12 years, mostly in North Louisiana.

Watson has been connected with Norvell-Wilder Supply Co., oil-field supply firm, in a selling capacity for 7 years. He received his college education at Henderson State Teachers College of Arkansas, and Los Angeles City College, in Los Angeles.

Casey & Montgomery, Bakersfield, Calif., are drilling on a 7,000-ft. wildcat test in the Reef Ridge area, 5 miles southwest of Avenal, in Kings County, California. It is a contract job for Golden Bear Oil Co. and John Manley, III. Designation is 31-X-16 Mouren. Spot location is in 16-23-17.

Longhorn Drilling Co., Three Rivers, Tex., is on a new operation for Finley Co. in the Gyp Hill area, 3 miles southeast of Falfurrias, in north-

COUPLINGS
ELMAGCO
BRAKES



SINGLE UNIT OFFERS POSITIVE BRAKING AND DRILL FEED CONTROL

The Baylor Company, Inc. now offers the drilling industry the ELMAGCO MPW*, a new type of positive brake, and drill feed control combined in a single package. The ELMAGCO is thousands of dollars cheaper and is contained in one small package.

The maintenance costs of friction brakes are completely eliminated with installation of the ELMAGCO.

The ELMAGCO MPW Brake package, a permanent part of the drawworks, has no chain drives or bulky extra equipment, saving time and money while rigging up and tearing down and offers the extra advantage of having the rig floor clear.

There is an ELMAGCO MPW Brake package designed for every drilling operation, regardless of the size and depth rating of the rig being used. Write for our illustrated folder on the ELMAGCO and its operation.

**Magnetic Particle Water-Cooled*

THE BAYLOR CO., INC.

P. O. BOX 18284 • HOUSTON 23, TEXAS

Offices in: Casper • Corpus Christi • New Iberia • Odessa • Oklahoma City • Reseda, California • Williston

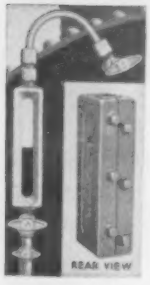
ELMAGCO PRODUCTS—DESIGNED AND BUILT FOR OIL FIELD SERVICE

SIMPLEX 310A Emergency Jack

Here's a Simplex to save time and manpower on scores of oil field jobs. Ideal for close quarter operation; for safe jacking of mobile equipment and skidding rigs. Tilts on base for angular jacking. Lifts full 15 tons capacity at any of four points listed above. Send for Bulletin.

MECHANICAL AND HYDRAULIC JACKS
SIMPLEX JACKS
SEND FOR FREE CATALOGUE
TEMPLETON, KENLY & COMPANY
2539 Gardner Road Broadview, Illinois
A. C. Templeton, 5627 Del Roy Drive, Dallas, Texas

INFERNO



REFLEX GAGE HAS EXTRA HEAVY GLASS

The INFERNO "Clamp Type" gage has wider, heavier glass than the ordinary reflex gage. This is a distinct advantage when water conditions are bad. Malleable iron clamps cover entire side of gage. Clamp action is applied so that force is spread over entire length of glass, eliminating breakage due to tightening set screws unevenly. Write for new Bulletin No. 34.

THE INFERNO CO.
Box 1138A
115 RICOU St.
SHREVEPORT, LA.
INFERNO

Southland
BATTERIES *give you*

SOUTHLAND BATTERY CO.
2040 AMELIA • DALLAS, TEX.
"Since 1933 . . . Quality Batteries by the South's Largest Independent Battery Manufacturer"

GERONIMO

DERRICK ESCAPE MECHANISM
FOR THE SAFETY OF YOUR DERRICKMEN
sold through your supply store
MANUFACTURED BY:
THE CHARLES MACHINE WORKS, PERRY, OKLAHOMA

MAP FILE

#MT4

Easiest way to file and find confidential maps, tracings, blueprints. Quality metal cabinet file with locking doors. 112 tilting tubes handle 60" prints. Tubes indexed for quick location. Ideal for field and home offices. Shipped from stock.

Patent No. 1610368. Other Patents Pending.
SCOTT-RICE CO., 610 S. Main, Tulsa 3, Okla.

eastern Brooks County, Southwest Texas. Location is at 1 Lasater, in the GB&CNG Survey 331. Drilling is set up to go to 7,000 ft. **Voss Drilling Co.** also is working for the same operator in this area. It has just completed Finley Co.'s 1 Peel, in the Tex-Mex Survey 157, as a gas well (48,000,000 cu. ft. daily) from a 7,250-ft. sand.

Cherry Drilling Co., Inc., is a newly formed contract-drilling firm headquartering at Wichita, Kans. The organization is headed by Franklin Hiebert, of Wichita, with Robert Frost, of McPherson, Kans., as drilling superintendent. It will operate primarily in Central and western Kansas.

Atlas Drilling Co., Opelousas, La., is under contract to Hudson Oil & Gas Co., with F. A. Callery, Inc., as joint operator, for a 13,500-ft. test to be drilled 1½ miles south of Ellis field, northwest of Crowley, in Acadia Parish, South Louisiana. It will be drilled on the operators' Zaumbrecher lease in 41-9s-1w.

Kerr-McGee Oil Industries, Inc., Oklahoma City, has taken another contract job in the Gulf of Mexico. It will be 14,000-ft. test for the C.A.T.C. group, with Continental Oil Co. as operator. Location is in Block 75, Vermilion area, about 15 miles off the coast of Vermilion Parish, Louisiana.

Field Drilling Co., San Antonio, is on a new 8,000-ft. contract job a mile southwest of La Salle, in Jackson County, Texas Gulf Coast. Drilling is for J. M. Flaitz and R. B. Mitchell, of Houston. Location is on their Bennet lease, in the Valentine Garcia Survey.

Nichlos Drilling Co., Houston, has a new wildcat operation under way in St. Martin Parish, Coastal Louisiana. It is a 12,000-ft. test, 1 Ozenne, in 52-8s-6e, about 2 miles north of Cecelia field, and about 4 miles west of Plumb Bob. Drilling is for Renwar Oil Corp. and Nichlos Oil & Gas Co.

Vick Drilling Co. is getting under way on a new wildcat job 10 miles west of Grapeland, in Houston County, East Texas. It is a contract operation for F. R. Jackson, of Longview, Tex. Contract calls for a Woodbine test with objective about 6,250 ft. Location is at 1 Dailey heirs, in the Garrison Greenwood Survey.

Makin Drilling Co., Hobbs, N. M., is drilling for Humble Oil & Refining at a wildcat location 8 miles east of Lightcap field, in eastern Chaves County, southeastern New Mexico. It is a 10,000-ft. test at 1 Railroad Mountain Unit. Makin is using its Rig No. 4, with Otho Ward as tool pusher. This contractor has another new operation under way. It is a 5,110-ft. San Andres test (1-J Wilson) for Cities Service Oil Co. in the recently discovered Buckshot area, 20 miles northeast of Bronco, and across the state line in Cochran County, West Texas. Makin has its Rig No. 6 on the job with J. E. Bracken as tool pusher.

THE GRANT CUSHION STABILIZER

The advanced tool for modern drill string **stabilization**

- permits **more weight** on the bit without increased hole deviation
- keeps drill collars **centered** and **rotating** freely
- **reduces torque** to the minimum
- gives **longer work life** with more efficiency and maximum **safety**

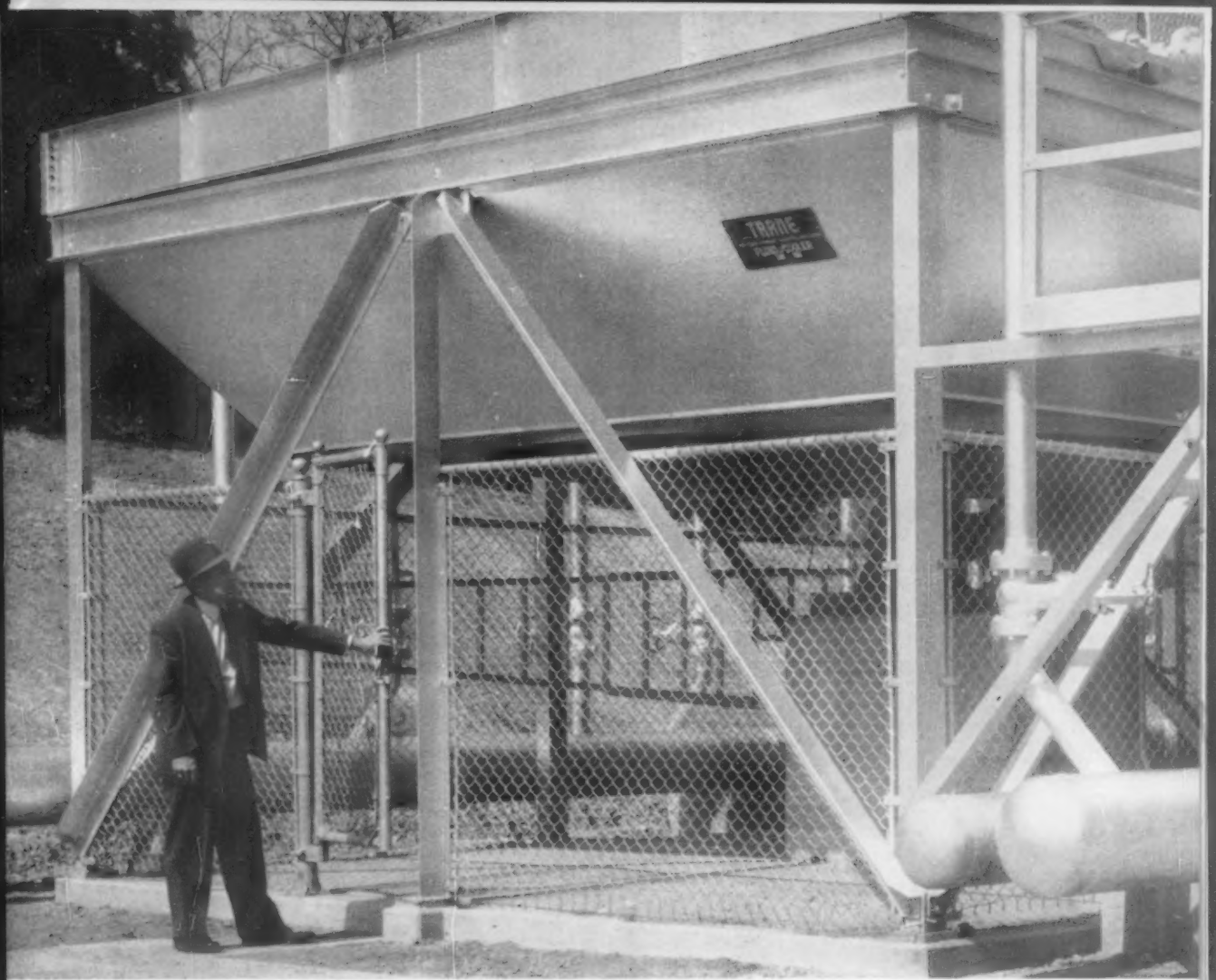
For the full story, request Grant Bulletin 63 and the free pocket-size booklet, "How to Avoid Crooked Hole."

GRANT
OIL TOOL COMPANY

Main Office and Plant

2042 East Vernon Avenue • Los Angeles 58, California

Branches in all the Principal Oil Centers



At Texas Eastern's Holbrook, Pa. compressor station, engineered by Brown and Root, three TRANE Fluid

Another major pipeline installs Trane

Trane equipment now on the job at Texas Eastern's Holbrook, Pa. station

More and more pipeline transmission companies are turning to TRANE Fluid Coolers to handle important cooling jobs. Many of these users have reported that TRANE Fluid Coolers are rugged, dependable and simply designed . . . with a minimum of maintenance and adjustment problems.

When you turn to TRANE, you can depend upon the *accuracy and completeness* of TRANE's capacity ratings. These ratings are based upon thorough laboratory testing—supported by many years of actual field experience.

Unlike many manufacturers, TRANE makes all its own coils—has had thirty years of experience in this highly specialized field. And trained personnel in 90 TRANE field offices take a responsible interest in *your* particular fluid cooling job! That's why you can turn to TRANE when you have a fluid cooling problem—confident that TRANE can meet your requirements—*and deliver!*

For complete information on how TRANE can help you, call your nearby TRANE Sales Office—or write TRANE, La Crosse, Wisconsin.

A few of the well known Firms using Trane Fluid Coolers

Engine Coolers for Natural Gas Compressor Stations

Texas Eastern Transmission Corp.
Sun Oil Co.
Wilcox-Trend Gathering System
Westcoast Transmission Company, Limited
Shell Oil Co.

Process Fluid Cooling

Bethlehem Steel Co.
The General Tire & Rubber Co.
Aluminum Co. of America

Coolers are used for cooling jacket water and lube oil cooling water for eight 1100 hp gas engine compressors.

transmission company Fluid Coolers !

Air handling equipment — three 14-foot fans deliver total of 711,000 cfm. Fan, motor and gear box are factory-aligned on a single metal base. All framework parts are pre-drilled and match-marked.

Removable Plugs opposite tubes offer access to simplify cleaning and inspection. These are standard coils with flat plate aluminum fins *mechanically* bonded to $\frac{5}{8}$" OD x .035 Admiralty tubes.

For any air condition, turn to

TRANE

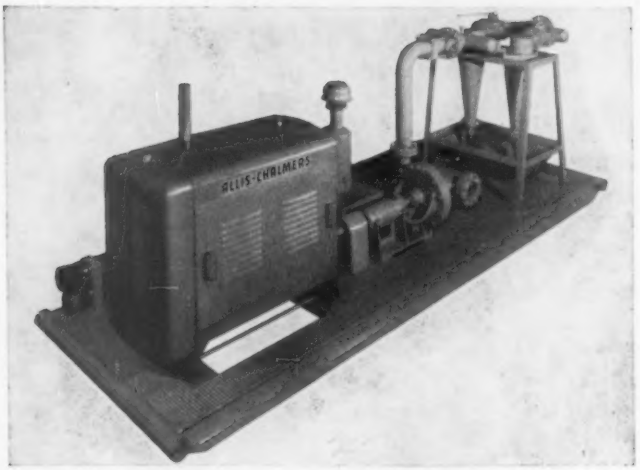
MANUFACTURING ENGINEERS OF AIR CONDITIONING, HEATING, VENTILATING AND HEAT TRANSFER EQUIPMENT

The Trane Company, La Crosse, Wis. • Eastern Mfg. Div., Scranton, Pa. • Trane Company of Canada, Ltd., Toronto • 90 U.S. and 19 Canadian Offices.

the OIL AND GAS JOURNAL

Showcase

OF NEW EQUIPMENT AND LITERATURE



Mud Cone Cuts Costs, Saves Bits

The new Mud-Cone 28 consists of two manifolded 8-in. diameter Heyl & Patterson wet cyclones, a centrifugal pump, and an engine. It removes sand and fine cuttings from drilling muds. Capacity of the unit is 10 bbl. of mud per minute. Treatment of drilling muds with a Mud-Cone 28 reduces mud costs and pump repairs and increases drilling rates and bit life. Separation of solids is accomplished by centrifugal force, created by tangential entry of mud into the cyclones. Sand and cuttings drop from the apexes of the cyclones into a waste pit and clean mud from the top of the cyclones is returned to the mud pits.

The Mud-Cone 73 uses 3-in. diameter cyclones. It removes clay from weighted drilling fluids and reclaims the barite. Large savings are possible by eliminating costly watering back and rebuilding of weight when high-mud viscosity must be combated. **Write or call Rotary Drilling Services, Inc., Box 7265, Tulsa, for more information on Mud-Cone 28.**

•

Pressure Relief Valves Tested Easily by Hand

Two new pressure-relief valves are known as Models 412 and 414. The difference between them is in the method of pilot-valve loading and type of pilot valve. The new valves afford a simple, accurate, dependable means of relieving excessive pressures at strategic points in the systems.

Line pressure is used for opening and

Send this *Showcase Coupon*
to the **Manufacturer** of the item in which you are interested. See name, address, and equipment name and/or model, in boldface type at end of description.

• • •

NAME AND/OR MODEL NUMBER_____

_____

_____

Described in the OIL AND GAS JOURNAL - Issue of **Feb. 11, 1957**

NAME_____ TITLE_____

COMPANY_____

ADDRESS_____

CITY_____ STATE_____

DATE_____

KING SIZE

This giant 37 ton Cat Poly Reactor is one of 4 units shipped to a large petroleum refinery in the State of Washington. It is 4'-3½" in diameter by 32'-0" long and has a 1 3/16" thick shell. Each of its 8" thick heads is attached to the shell channel with 28 special alloy stud bolts 2¾" diameter by 15¼" long having nuts 4¼" across the flats. Into the 5¾" thick tube sheets 190 tubes, 2½" O. D., No. 5 gauge and 30'-0" long, are rolled and seal welded. Designed for 1,230 lbs. pressure on the tube side, the reactor was completely X-rayed and stress relieved.

Vogt, a leading builder of shell and tube reactors for poly plants, has the competently skilled personnel and modern mechanical facilities with which to provide heat transfer equipment for the most exacting services in petroleum refineries, chemical plants, and related industries.

Reactors ...by Vogt

A bulletin describing the wide range of heat transfer equipment built by Vogt is available upon request.

Dept. 24A-XO

HENRY VOGT MACHINE CO., LOUISVILLE, KENTUCKY

BRANCH OFFICES: NEW YORK, CHICAGO, CLEVELAND, DALLAS, PHILADELPHIA, ST. LOUIS, CHARLESTON, W. VA.

closing these valves with opening pressure preset by application of deadweight or spring loading. These valves can be tested at any pressure by hand lifting the pilot stem which operates them. There are only two moving assemblies and all elements of the valve are easily maintained and inspected. The valves are suitable for operation at temperatures up to 300° F. and 400° F. valves are available on special order. Models 412 and 414 are made with either single or double-outlet valves.

Model 412 has a ball-seated pilot valve, usually deadweight loaded. When the force under the ball equals the force of the weights or the spring force, the pilot opens, causing the main valve to open. After the pressure has bled down approximately 15 per cent, the ball is forced down on the seat and the main valve then closes.

Model 414 has a flat-seated pilot valve. Usually the pilot valve is spring loaded, but it may be deadweight loaded, also. It opens under the same conditions as Model 412. However, when the pressure has bled down approximately 25 per cent, the disk is forced down on the seat and the main valve closes.

These valves are best adapted to fluids having a viscosity lower than water. Model 412 and 414 pilots are available in four ratios: 5:1, 10:1, 25:1, and 50:1. **Write or call Kinzbach Tool Co., 2411 Summer Street, Houston 10, Tex.**

●

Seven-Digit Counter Is For Pneumatic Systems

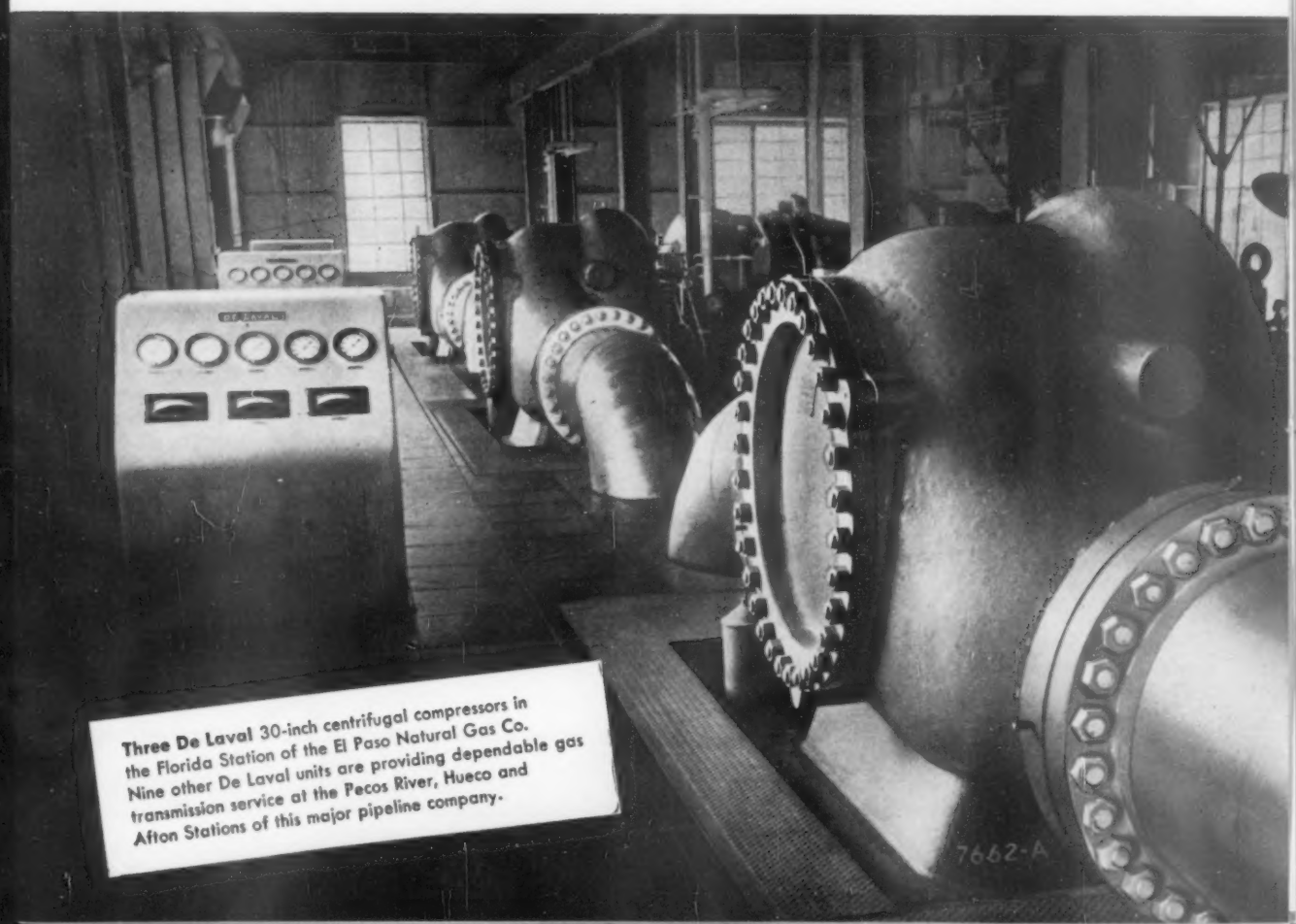
A remote integrating counter is used with pneumatic - transmission systems. The seven-digit counter receives its signal from a measuring transmitter which operates on an impulse-duration system. Since the electric signal transmitted is a function of time, line-voltage variations do not affect the accuracy of the counter.

The counter is housed in a small flush-mounted case for use near a pneumatic recording or indicating receiver on a panel board, or in whatever location its use would prove most valuable. **Write or call Bristol Co., Waterbury 20, Conn., for Bulletin A128.**

●

Metering Separator Gives High Capacity and Accuracy

A spherical metering separator for well testing and other purposes consists of a 41-in. o.d. spherical oil and gas separator and a dump type of positive-displacement meter. This metering sep-

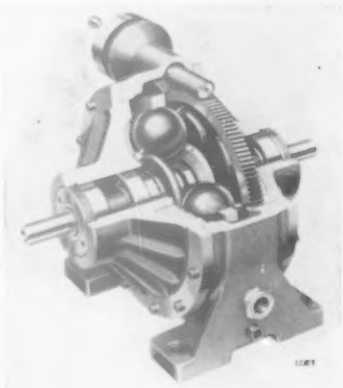


Three De Laval 30-inch centrifugal compressors in the Florida Station of the El Paso Natural Gas Co. Nine other De Laval units are providing dependable gas transmission service at the Pecos River, Hueco and Afton Stations of this major pipeline company.

arator offers such features as compactness—over-all height only 78 in.—and high capacity. It is rated at 6,000,000 c.f.d. of gas and 1,500 bbl. of well fluids per day.

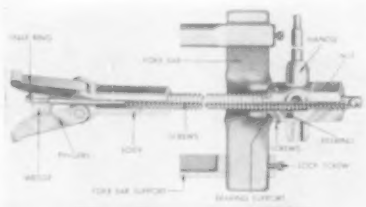
The new controls system has shown an accuracy of 99 per cent in field tests. Accuracy is obtained by use of a snapper diaphragm-operated pilot to cause rapid action of the motor valves, and an action-delay mechanism to prevent both inlet and outlet motor valves to the meter compartment from being open at the same time, thus preventing flow-through of unmetered oil.

The controls system is simple and easily calibrated, yet rugged and dependable. The separator employs a centrifugal separating ring and ceramic-saddle mist extractor to separate the gas from the well fluids. **Write or call Sivalls Tanks, Inc., Box 1152, Odessa, Tex., for more information on the spherical metering separator.**



New Drive Provides Smooth Speed Change

The Cleveland Speed Variator is a new variable-speed drive. It provides infinitely variable output speed regulation from one-third to three times the input speed, or 9:1 total range. The mechanism will operate either clock-



Liner Puller Designed to Prevent Liner Distortion

This improved liner puller will pull any pump liner 3½ to 9 in. in size. An improvement is the adjustable-yoke bar supports which permits positioning on the pump deck for maximum support. An open slot in it makes it unnecessary to run the nut over the entire length of the screw each time a liner is pulled. The nut assembly uses a roller thrust bearing and is reinforced by a bearing support to prevent distortion over the portion of the yoke which is open to receive the screw.

Size No. 0500 will pull 3½ through 5-in. liners. Size No. 0900 will pull 4½ through 9-in. liners. Each unit is self-contained which eliminates danger of losing accessory equipment. **Write or call Grant Oil Tool Co., 2042 East Vernon Avenue, Los Angeles 58, Calif.**

DE LAVAL

CENTRIFUGAL COMPRESSORS

on the job at El Paso Natural Gas

De Laval centrifugal compressors offer many important engineering features. (1) They are designed to handle an increased ultimate flow, can be quickly converted to larger capacities by replacing the impeller, diaphragm and a few minor parts. (2) The high pressure shaft seal eliminates leakage, consumption of sealing oil is negligible. (3) There is only one moving part—the rotor—which has ample clearance. (4) Units are compact, require smaller foundations and smaller stations. (5) First costs and installation costs are low.

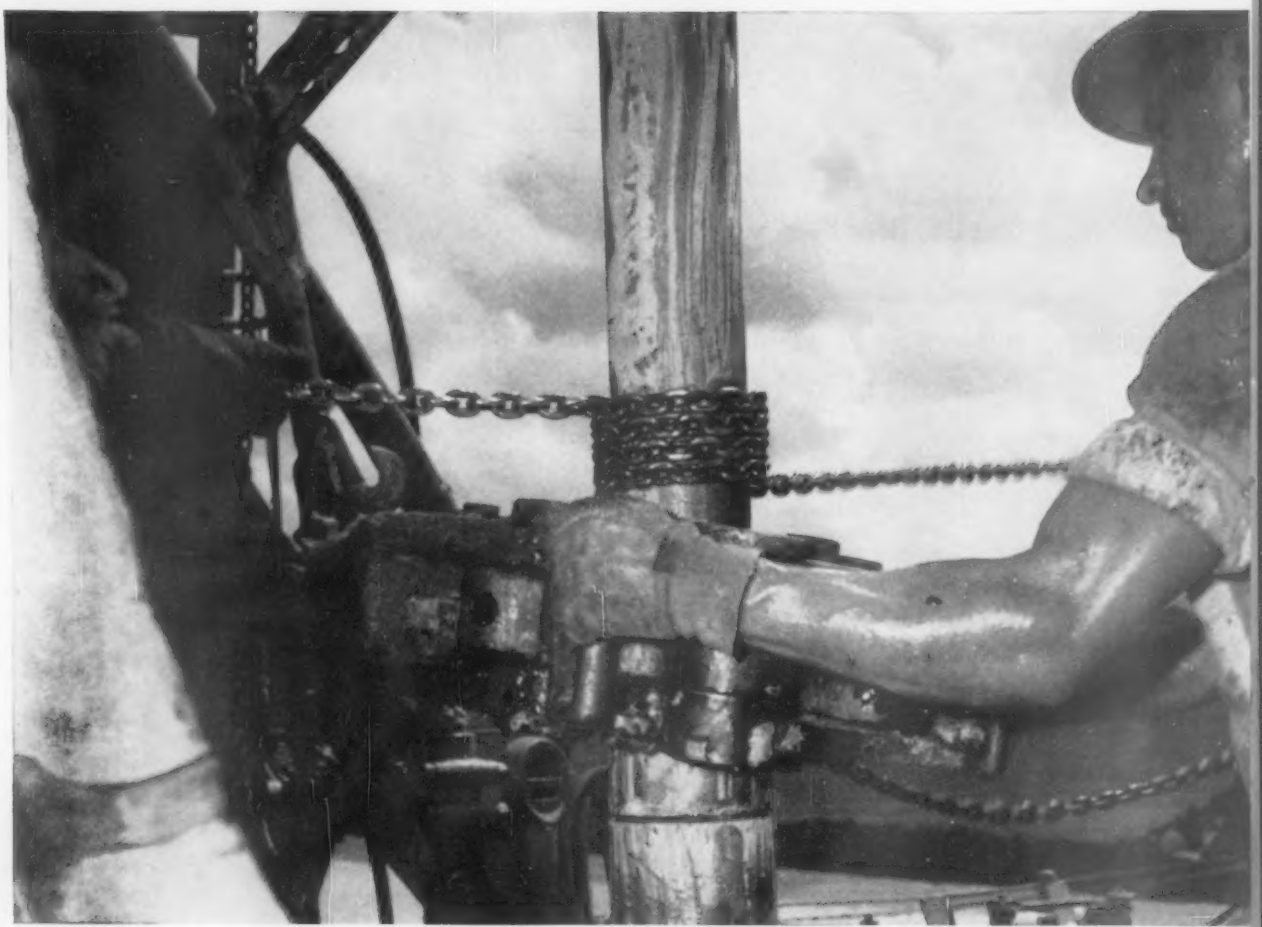
Bulletin 503 gives data on De Laval Centrifugal Compressors. Write for your copy.

DE LAVAL *Centrifugal Compressors*

DE LAVAL STEAM TURBINE COMPANY

810 Nottingham Way, Trenton 2, New Jersey

DL375



OTHER REPUBLIC CHAIN PRODUCTS available for oil-field service include load-binding chain, cat-line chain, general duty pick-up chain, blow-out preventer anchor chain, boomer chain, tow chain and truck and tractor tire chains. In addition, Republic furnishes all necessary chain fittings and accessories for every application.

REPUBLIC

REPUBLIC STEEL

World's Widest Range of Standard Steels

Republic Steel Alloy Spinning Chain

DEFIES SHOCK, ABRASION AND FATIGUE

Maximum service life is the key to making up more joints at less cost when you spin-in with Republic Alloy Spinning Chain. It's built to stand the rugged duty of round-the-clock oil-field operations—and come back for more.

There are good reasons why you can expect superior service and safety, plus greater efficiency and economy, from Republic Alloy Spinning Chain. First, it is made of a special analysis alloy steel, produced by Republic to exacting standards from raw ore to finished steel. Next—Republic's new, smoother weld cuts down wear, improves spinning characteristics. Third, it is heat treated to produce extreme strength and toughness—the basis of its excellent resistance to shock, abrasion and fatigue stresses.

Finally, every manufacturing step is double checked by exhaustive quality-control procedures, and completed chain is proof tested. A test certificate will be furnished on request.

Republic Alloy Steel Spinning Chain is more than twice as strong as low-carbon chain of the same size. It is available from your oil country distributor in sizes 9/32-inch and 5/16-inch x 14 through 33 feet.

Mail coupon today for further information.

HIGH STRESS AND IMPACT RESISTANCE, without excess weight, are major advantages of oil-field equipment made of Republic Alloy Steel. Its great strength-to-weight ratio permits reduced cross sections in tongs, bits, blocks, draw-works components and other applications, with no sacrifice of safety or dependability. Send coupon for facts.

HELP AVOID TROUBLE by specifying Republic Electric Weld Casing. Because it is formed from flat rolled steel of carefully controlled width, thickness and surface, resulting pipe provides uniform distribution of metal in threaded ends. In addition, normalizing and cold sizing increase ductility and yield strength to provide maximum collapse-resistance.

STEEL

and Steel Products

REPUBLIC STEEL CORPORATION
Dept. C-2987
3112 East 45th Street, Cleveland 27, Ohio

Please send me further information on:
- ☐ Alloy Spinning Chain
- ☐ Chain Products and Accessories
- ☐ Alloy Steel
- ☐ Electric Weld Casing

Name_____ Title_____
Company_____
Address_____
City_____ Zone____ State_____

for simplicity . . dependability . . low maintenance
Specify . . . . . .

VOL-U-METER®

REG. U. S. PAT. OFF.

the accurate oil and water volume meter

PAT. APP. FOR
MODEL 5-CV-01
VOL-U-METER

Specifications are for 125 psi W. P. CV and FV units. Information on other W. P. models available on request.

FOR USE WITH OIL AND GAS SEPARATORS AND EMULSION TREATERS

Field-engineered to make continuous, trouble-free operation, calibration and maintenance as easy as possible, the VOL-U-METER gives dependable, accurate performance at the lowest possible cost. Maintenance cost per unit averages less than $10.00 per year! Operating methods are quickly and easily understood. For dependable, accurate metering units, specify VOL-U-METERS. Available with pneumatic or electrical controls.

WRITE FOR NEW LITERATURE

Sales and service representatives in all major oil fields.

SPECIFICATIONS AND DIMENSIONS

MODEL NUMBERS	2½ CV 01	2½ FV 01	5 CV 01	5 FV 01	10 CV 01	10 FV 01	20 CV 01	20 FV 01	50 CV 01	50 FV 01	100 CV 01	100 FV 01
Volume per Dump, Bbl.	⅛	⅛	½	⅛	1.0	1.0	2.0	2.0	5.0	5.0	10"	
Rated Metering Capacity, BPD	300	300	500	500	720	720	1440	1440	2000	2000	4"	
Avg. Expected Metering Accuracy, Percent	99.01	99.80	99.22	99.90	99.44	99.95	99.56	99.97	99.75	99.98	3"	
A Shell and Base O.D., Inches	16"	18"	20"	24"	24"	24"	30"	30"	36"	36"	4"	4"
B Length of Dump, Inches	12.62"	17¼"	16.06"	20 21/32"	22.20"	31 1/16"	28.20"	38¼"	49.00"	60 21/32"	55.00"	
C Overall Height, Inches, Approx.	35¾"	48"	43⅞"	53"	51½"	64½"	63⅜"	75"	88¾"	98 7/32"	10"	
D Center Line Height of Valves	6"	6"	7"	7"	7"	7"	8"	8"	8"	8"		
E Center Line of Unit to Face of Inlet & Outlet Valves, Inches, Approx.	8"	8"	13"	13"	13"	13"	15"	15"	18"	18"		
F Size of Inlet & Outlet Valves, Inches (Standard)	1"	1"	2"	2"	2"	2"	3"	3"	3"	3"	4"	4"
G Gas Equal. Conn., Inches	1"	1"	2"	2"	2"	2"	3"	3"	3"	3"	3"	3"
H Height of Upper Liquid Level, Inches	28"	35 11/16"	34⅞"	40 29/32"	41¾"	52"	51¾"	62 13/32"	74½"	85⅜"	86⅞"	94¾"

OIL METERING and Processing EQUIPMENT CORP.
MELROSE 5-1226 • 4843 YALE STREET
HOUSTON 18, TEXAS

Longer Valve Life with Colmonoy Hard-Facing

Catalyst slide valve gates, throats, and bodies last up to five times longer when hard-faced with Colmonoy No. 1 electrodes. The success of Colmonoy No. 1 in resisting erosion by catalytic fluids has made it the standard material for hard-facing slide valves by many maintenance shops, job shops, and valve manufacturers.

Colmonoy No. 1 electrodes have a new metallic coating that improves arc stability, permits vertical welding, and eliminates weld cleaning between successive passes. This reduces welding time to cut the already low cost of reclaiming valves with Colmonoy hard-facing.

Two 8 inch slides and throats after being reclaimed with Colmonoy No. 1 (shown finish ground)

A valve slide being hard-faced with Colmonoy No. 1 electrodes.

Write for Colmonoy Hard-Facing Manual #79 for more about Colmonoy hard-facing alloys and methods.

HARD-FACING & BRAZING ALLOYS

WALL COLMONOY CORP.

19345 JOHN R STREET - DETROIT 3, MICHIGAN

BIRMINGHAM • BUFFALO • CHICAGO • HOUSTON • LOS ANGELES
MORRISVILLE, PA. • NEW YORK • PITTSBURGH • MONTREAL • GREAT BRITAIN

wise or counterclockwise on input speeds up to a maximum of 1,800 r.p.m. Speed regulation can be either manual or automatic. Other features include rapid response to speed change, precise adjustment, and accurate maintenance of speed settings. **Write or call Cleveland Worm & Gear Co., 3249 East Eightieth Street, Cleveland 4, Ohio, for more information on the Speed Variator.**

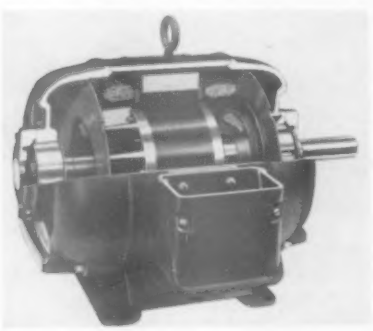
•

Diesel Engine Offers Choice of Starters

This six-cylinder diesel engine offers a left or right-hand build to fit any installation. It is available with an electric starter, an air starter, or a hand-operated hydraulic starter. Either a pack heat exchanger or a built-in heat exchanger reduces wear by warming the lubricating oil quickly and by maintaining the proper working temperatures.

It can be supercharged and has several power-takeoff points. **Write or call Rolls-Royce, Ltd., Derby, England, for more information on the C6 six-cylinder engine.**

•



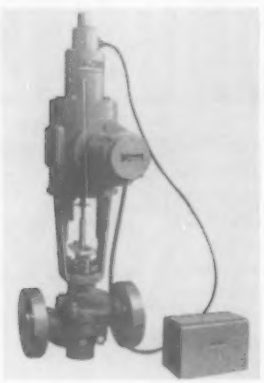
Newly Rerated Motors Offer Construction Improvements

Series 254U motors have been rerated to conform with new requirements established by N.E.M.A. The motors feature tandem fans—one pushing and another pulling. This arrangement produces a washing action over the field-coil ends to lower internal temperatures.

The bearings are inspected easily without dismantling the motor. The bearings run in double-width races and have large grease reservoirs. Numbers on the leads are permanently numbered which simplifies installation and maintenance. One-piece, shrouded-end heads give the motors protection against moisture and falling objects. **Write or call Robbins & Myers, Inc., Springfield, Ohio, for more information on the Series 254U motors.**

•

All-Electric Actuator Controls Valves



An all-electric proportional-positioning actuator for use in conjunction with electronic-control systems is available. The Series D actuator requires no intermediate pneumatic or hydraulic operating fluids. It combines the features of an all-electric system with the mechanical simplicity of pneumatic actuators. It is suitable for application on valves and other processing equipment which includes: (1) single-seated control valves; (2) double-ported control valves; (3) butterfly valves; (4) proportioning pumps; (5) and mechanical and electrical speed controllers.

The Series D actuator also is oper-

OIL AND GAS JOURNAL *Showcase* .....OF NEW EQUIPMENT

Send this *Showcase Coupon* to the **Manufacturer** of the item in which you are interested. See name, address, and equipment name and/or model, in boldface type at end of description.

• • •

NAME AND/OR MODEL NUMBER _____

_____

_____

Described in OIL AND GAS JOURNAL Issue of **Feb. 11, 1957**

NAME _____ TITLE _____

COMPANY _____

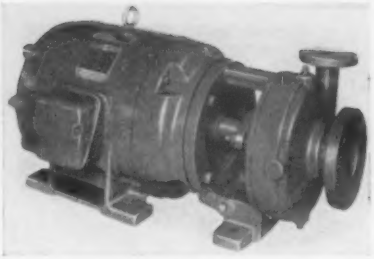
ADDRESS _____

CITY _____ STATE _____

DATE _____

ated in all-electric systems. An example is the automatic control of signals over long distances, such as encountered in tank farms and pipeline remote-control systems. It can be used in toxic atmospheres, or in areas where extremely low ambient temperatures are present. **Write or call Conoflow Corp., 2100 Archer Street, Philadephia 3, Pa., for Bull. D-1.**

●



Pump Line Offers Capacity To 600 Gal. Per Minute

A new line of standard, close-coupled, centrifugal pumps are designed to handle a wide range of general applications where conditions do not necessarily require a more costly engineered pump.

Identified as Type GSC, the line compresses seven pumps with capacity up to 600 g.p.m. and total dynamic head up to 275 ft. Temperature range of liquids that can be pumped is from —40° to +250° F.

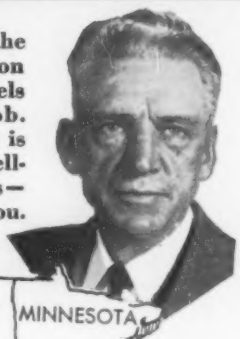
The line is available from stock in materials of three standard classifications; bronze fitted, all iron, and all bronze. Standard construction includes a removable back head to permit removal of the impeller without disturbing the piping; a large cradle opening for free access to the stuffing box; and a stuffing box adaptable, interchangeably, to packing and mechanical seal. **Write or call Dean Brothers Pumps, Inc., 323 West Tenth Street, Indianapolis 7, Ind., for Circular No. 191.**

●

WHEN IT COMES TO SERVICE

COME TO REILLY

● **Coating jobs in this part of the country are on a Paul Bunyon scale—and the coal tar enamels have to do a giant-size job. That's why Harry Holstrum is pretty busy in Minneapolis selling Reilly Coal Tar Enamels—but not too busy to talk to you.**



Harry Danz has discovered that his friends, old and new, know that ordering Reilly Coal Tar Enamels means deliveries when they're wanted... as they're wanted. Harry also finds that his customers are sold on Reilly products from the start for their top quality looks and superior performance records.

Reilly COAL TAR PRODUCTS

Reilly Tar & Chemical Corporation

MERCHANTS BANK BUILDING, INDIANAPOLIS 4, INDIANA

Sales Offices in Principal Cities

7200 WALKER STREET MINNEAPOLIS 16, MINN

Combination Switch and Gage Protects Equipment

Here is a new combination safety switch and pressure gage equipped with both high and low-pressure contacts. The unit can be used to shut down equipment, sound an alarm, flash lights, or operate other types of controls on pipeline pumps, water-flood projects, gas-compressor stations, or other places where either high or low pressure could cause damage to unattended equipment.

The contacts are visible and adjustable. The unit is available flush mounted on panels and factory wired for simplified installation, where multiple-pressure applications are involved. **Write or call Frank W. Murphy-Manufacturer, Inc., Box 1476, Tulsa.**

●

New D-Sander Designed To Save Bit and Pump Wear

A new Size 2 D-Sander is designed for hard-formation drilling. It features low first cost, low-operating cost, light

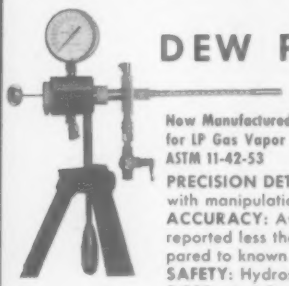
REFINERY SUPPLY COMPANY

REFINERY SUPPLY COMPANY
621 EAST FOURTH STREET
TULSA 3, OKLAHOMA
2215 McKINNEY AVENUE
HOUSTON 3, TEXAS

CENCO
CENTRAL SCIENTIFIC COMPANY
1700 IRVING PARK ROAD
CHICAGO 13, ILLINOIS

REFINERY SUPPLY COMPANY

DEW POINT TESTERS



ASTM-D 1142-53

Now Manufactured In Two Models For LP Gas and Natural Gas. 0-1000 psi for LP Gas Vapor and Natural Gas. Model also available in 0-3000 psi. ASTM 11-42-53

PRECISION DETERMINATIONS: Bureau of mines tests show that with manipulation dew points can be duplicated to within 0.2° F.
ACCURACY: Averaging test measurements, the Bureau of Mines reported less than 0.2°F. Dew point temperature difference compared to known standards.
SAFETY: Hydrostatic tests show a maximum working pressure of 3,000 psi. Adjustable mirror allows for safe visual observation into the pressure body.

DEW POINT RECORDER

BUREAU OF MINES TYPE

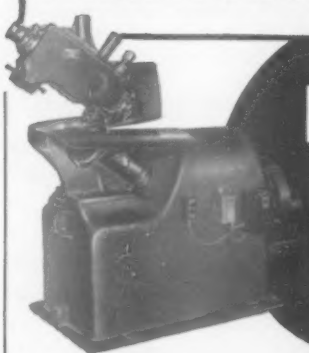
RECORDS DEW POINT OF GASES UNDER PRESSURE

SUITABILITY: For use with gases under pressure; at pressures from atmospheric to 3,000 psi.
CONTINUOUS RECORD: of dew point gas.
RAPID RESPONSE: To changing dew point of gas.
RELIABLE RESULTS: Obtained to allow for the control of dew point of natural gas in long distance high-pressure transmission lines. This instrument records dew point of a continuous sample of natural gas at line pressure up to 3,000 psi.

REFINERY SUPPLY COMPANY

REFINERY SUPPLY COMPANY

MARSHALLTOWN



ROTARY
THROATLESS
SHEARS

Capacities from 18 Gauge to ½"
Cuts any SIZE . . . any SHAPE

America's finest for every cutting job—straight, irregular or circular patterns.
Speedy—up to 6 ft. per minute. Efficient, easy to operate. Built for extra heavy duty use. High grade tool steel cutters.

Write today for details and prices.

Marshalltown Manufacturing Co.
Marshalltown 7, Iowa

A Knowledge of
Your Business is
Our Business

OIL and GAS
DEPARTMENT

Mercantile National Bank
DALLAS, TEXAS

PERU—Designed for Mid-Continent customer in Peru, this drawworks and Unit Rig 4-engine rig drive is Athey track-mounted for easy moving over difficult terrain.

CANADA—Unit Rig U-1220 drawworks and Mid-Continent 3AE swinging compound rigging up at Canadian location. Below—wintertime at Drayton Valley, Canada.

VENEZUELA—Barge above equipped by Mid-Continent for use on Lake Maracaibo. Below—U-1220 Unit Rig drawworks electric motor powered for Gulf off-shore location.

GULF COAST—Drilling tender serving Mid-Continent—equipped barge off Louisiana Coast. Equipment includes Unit Rig U-1220 drawworks, 3AE Rig Drive, Emsco D-700 pumps, and pump drive.

Mid-Continent goes where you go with dependable oil field supplies

Men in the business of drilling and producing oil wells over the world daily solve supply problems by keeping in close contact with Mid-Continent representatives.

Mid-Continent Supply Company's completely-stocked field stores provide 24-hour service and famous brand products from Anaco and Maracaibo to the Canadian North Land . . . and Mid-Continent's Export Division is organized to supply oil producing regions world wide.

Whether you need a single item or a complete drilling rig, call Mid-Continent for sure service, sure supply.

MID-CONTINENT
Supply Company
MID-CONTINENT BLDG. • FORT WORTH, TEXAS

THE WORLD'S LARGEST INDEPENDENT OIL FIELD SUPPLY COMPANY

weight, and portability. The D-Sander also can be used for slip-hole drilling in a wide variety of formations. It has a capacity of up to 250 g.p.m. It compliments the capacity ranges of the Size 4 and Size 6 D-Sanders which have capacities up to 500 and 800 g.p.m.

By the use of the D-Sander, drilling fluids are substantially freed of drilled solids. It solves the problem of abrasive sand which is particularly a problem in the Gulf Coast area. The life of bits and pump parts are substantially increased when the D-Sander is used. In addition, the high viscosity of mud laden with drilled solids reduces drilling rates as much as 25 per cent. Savings can be realized in areas where abrasive formations are not found. In these areas, the flour-sand Dorrco D-Sander removes all drilled solids above 30μ in size. This speeds up drilling as much as 15 per cent in some cases. **Write or call Salt Water Control, Inc., Fort Worth National Bank Building, Fort Worth 2, Tex., for more information on Size 2 Dorrco D-Sander.**

Battery-Powered Corrosion Meter Is Light, Sensitive

Because it is battery operated, this new corrosion meter can be used either in the field or the laboratory. Called the Corro-Dex, it employs single-knob control and measures corrosion as low as 0.000001 in.

Weighing only 9 lb., it comes in an aluminum carrying case measuring 9 by 9 by 6 in. and equipped with a carrying strap and hinged cover. The circuit is a full-transistor shockproof type.

The meter is suitable for corrosion tests in petrochemical plants, for determining inhibitor characteristics of oils and gasolines; and for determining the effectiveness of cathodic-protection devices. **Write or call Labline, Inc., 3070-82 West Grand Avenue, Chicago 22, for more information on the Corro-Dex corrosion meter.**

TRADE MARK REG. U. S. PAT. OFF.
TIME TESTED
MACCO
GAS LIFT

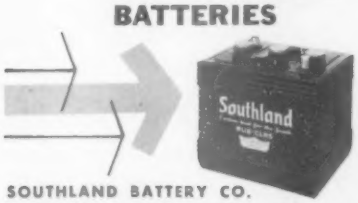
Telephones:

MIDLAND
MUtual 3-3936
ODESSA
FEderal 7-1943
VICTORIA
Hillcrest 5-1731 WJ-53395
BEAUMONT
5-1958 ZF-78424
HOUMA, LA.
2-1285 7728
NEW IBERIA, LA.
EMerson 4-2674
*LONG BEACH, CALIF.
NE 6-4666
*LOS ANGELES, CALIF.
LU 7-5261
*VENTURA, CALIF.
MI 3-4033
*TAFT, CALIF.
5-3148
ALICE
MO 4-4993 MO 4-5787
*Calif. Rep. Emsco Mfg. Co.

MACCO
OIL TOOL CO.
1521 PRINCE ST., HOUSTON 1, TEX.
UN 1-1253
HO 5-7585 MI 9-0747 MO 5-3841
MO 5-6809 UN 4-6441 HI 7-2396

A COMPLETE LINE OF 6, 8 and 12 VOLT BATTERIES

COL. SOUTHLAND
Southland BATTERIES



SOUTHLAND BATTERY CO.
2040 AMELIA • DALLAS, TEX.
"Since 1933 . . . Quality Batteries by the South's Largest Independent Battery Manufacturer."

For Safety Unsurpassed
KELCO Safety SPINNING LINE and BREAKOUT CATHEADS

The Model 12 Non-Fouling Cathead

THE OUTSTANDING CATHEAD OF TODAY AND TOMORROW

Anti-Fouling Catline Spool
Completely Housed Friction Cathead
Simplicity of Design, Operation and Maintenance
Double-Plate Clutch
Anti-Friction Bearings Throughout as Recommended by Leading Bearing Manufacturers
Choice of Mechanical, Hydraulic or Air Controls

AVAILABLE THROUGH YOUR FAVORITE SUPPLY STORE
Representatives in All Fields
EXPORT REPRESENTATIVE—Val R. Wittich, 30 Rockefeller Plaza, New York, N. Y.
Be Safety Wise — KelCo-ize

KELCO BEN F. KELLEY CO., Inc.
TULSA, OKLAHOMA

SPINNING LINE CATHEADS • BREAKOUT CATHEADS • AIR OPERATED POWER SLIPS
TUBING TONGS • SAFETY "C" POLISHED ROD CLAMPS

OIL AND GAS JOURNAL

Showcase

- BULLETINS
- CATALOGS
- BROCHURES

Hyster Tractor Tools. An eight-page two-color folder illustrates and details a line of tools that work on and with Caterpillar tractors. Covered are excavator-cranes, draglines, shovels, clamshells, winches (including a special oil-well servicing winch), and rollers. Photos and recommended tractor-tool combinations are given. **Write or call Hyster Co., 2902 Northeast Clackamas Street, Portland 8, Ore., for form No. 1416 B.**

●

Drilling and Oil-Tool Specialties. A 12-page illustrated brochure presents oil-tool specialties for offshore and regular drilling. Specialized equipment shown includes custom-designed jacks for mobile barges, and rig-skidding jacks. The brochure also includes information on rig-up for export, special shop fabrications, and mud-system items. **Write or call Joe Stine, Inc., Box 14471, Houston 21, Tex., for Drilling and Oil-Tool Specialties brochure.**

●

Tuthill SU Pump Units. Catalog No. 107 contains eight pages. It presents information on the new line of Type SU pump units which are designed principally for handling heavy-fuel oils in industrial oil-burner service. The new units may be also used for the movement of any noncorrosive, highly viscous liquid with lubricating qualities. The pumps will produce pressures up to 300 psi. and in capacities up to 2,030 g.p.h. Charts and diagrams in the catalog give dimensions, operating characteristics, and pump and motor performance data. Performance guides enable the buyer to select units for particular applications. **Write or call Tuthill Pump Co., 939 East Ninety-Fifth Street, Chicago 19, Ill., for Catalog No. 107.**

●

Air Compressor Catalog. A new 20-page catalog covers a line of ⅓ to 20-hp. air compressors for industrial use. The illustrated booklet gives specifications on single and two-stage models, portable models, tanks, pumps, and accessories. Useful charts, data, and information on compressed air are also included. **Write or call Kellogg Div., American Brake Shoe Co., Rochester 9, N. Y., for Air-Compressor catalog.**

●

Morse Morflex Flexible Couplings. A line of mechanical couplings are described in this new 24-page catalog. The couplings use preloaded rubber biscuits for flexibility. Dimensions and specifications are given on standard, double, and radial couplings with additional data on coupling driveshafts. Torsional-deflection charts and instructions for use explain the method of coupling selection in controlling the torsional vibration of a system. **Write or call Morse Chain Co., Ithaca, N. Y., for Catalog C-41-56.**

●

Ramsey Winches. A line of winches for all trucks is detailed in the new four-page, multicolor Bulletin No. 1003. In addition to winches, the bulletin presents a line of speed reducers, power takeoffs, hanger bearings, universal joints, and equipment needed for installation and operation of truck winches. **Write or call Ramsey Winch Mfg. Co., Box 3067, Tulsa, Okla., for Bulletin No. 1003.**

●

Cylindrical-Conversion Chart. This chart converts gallon quantities into square feet of surface area. It aids in estimating the amount of material necessary to insulate cylindrical vessels. It was developed to eliminate complex mathematical calculations when vessels are designated only by gallon size, or by length and diameter. **Write or call Armstrong Cork Co., Lancaster, Pa., for Cylindrical-Conversion Chart.**

●

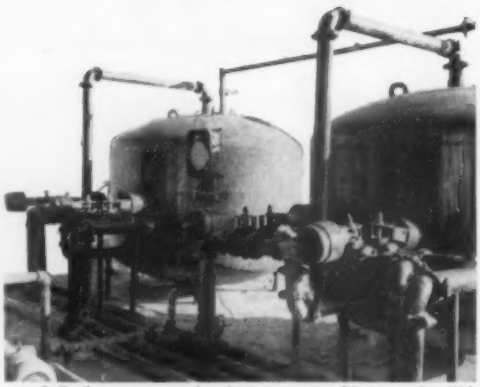
Miniaturized Low-Frequency Transformers and Reactors are described in the eight-page Catalog No. 105. It describes a line of input, output, interstage, and A.V.C. output transformers. It lists reactors and special reactors. Design and application information is given including mounting and space requirements. **Write or call Southwestern Industrial Electronics Co., Box 13058, Houston, Tex., for Catalog No. 105.**

●

Verti-Line Close-Coupled Industrial Pumps. This bulletin contains an easy-to-read table for determining horsepower, capacity, and head for vertical pumps. The 20-page, three-color Bulletin 1100 also contains sectional views, material specifications, schematic appli-

Only DeZurik

MAKES THE EASY-OPERATING PLUG VALVE WITH ECCENTRIC ACTION!



DeZurik gas operated valves on water filters at the Mid-Burbank Water Flood Project operated by Phillips Petroleum Company, Osage County, Oklahoma.

Whether it's dead-tight shut-off you want in a valve . . . or easy operation . . . or freedom from constant maintenance, you'll find the answer in DeZurik Plug Valves. **Exclusive** eccentric action guarantees easy, trouble-free operation; resilient plug-facing assures leak-free closure—every time! For more information on DeZurik Plug Valves, write

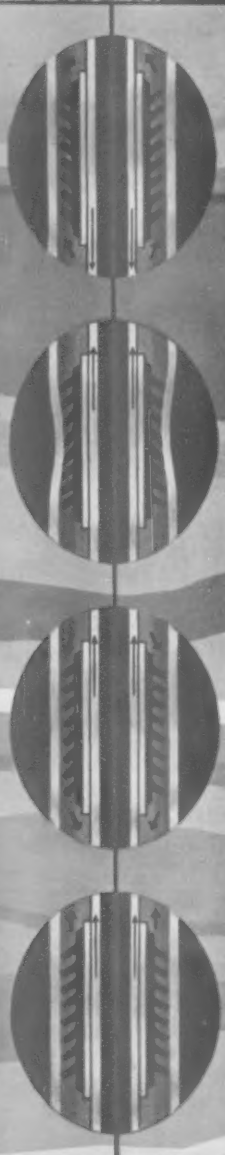
DeZurik Valves are available in sizes from ½" thru 20", in a full range of body metals, and for manual or remote operation.

DeZURIK CORPORATION
SARTELL, MINNESOTA.

FOUR REASONS WHY

MISSION E-Z SWABS

are fast, safe and economical



1. FREE FALLING

On the down stroke, clearance between fins and pipe allows swab to fall free.

2. PASSES SMOOTHLY THROUGH TIGHT SPOTS

Flexible E-Z Swab Rubber fins allow swab to pass smoothly through tight spots on both up and down strokes.

3. RELEASES OVERLOADS

When load is excessive, fins bend down to bypass excess fluid. This safety relief action prevents overloads and broken wire lines.

4. LONG LASTING

After overload is bypassed, fins spring up until they seal. Wear is slow because fins seal against pipe with light contact pressure.

Nothing but the finest will bear the name of

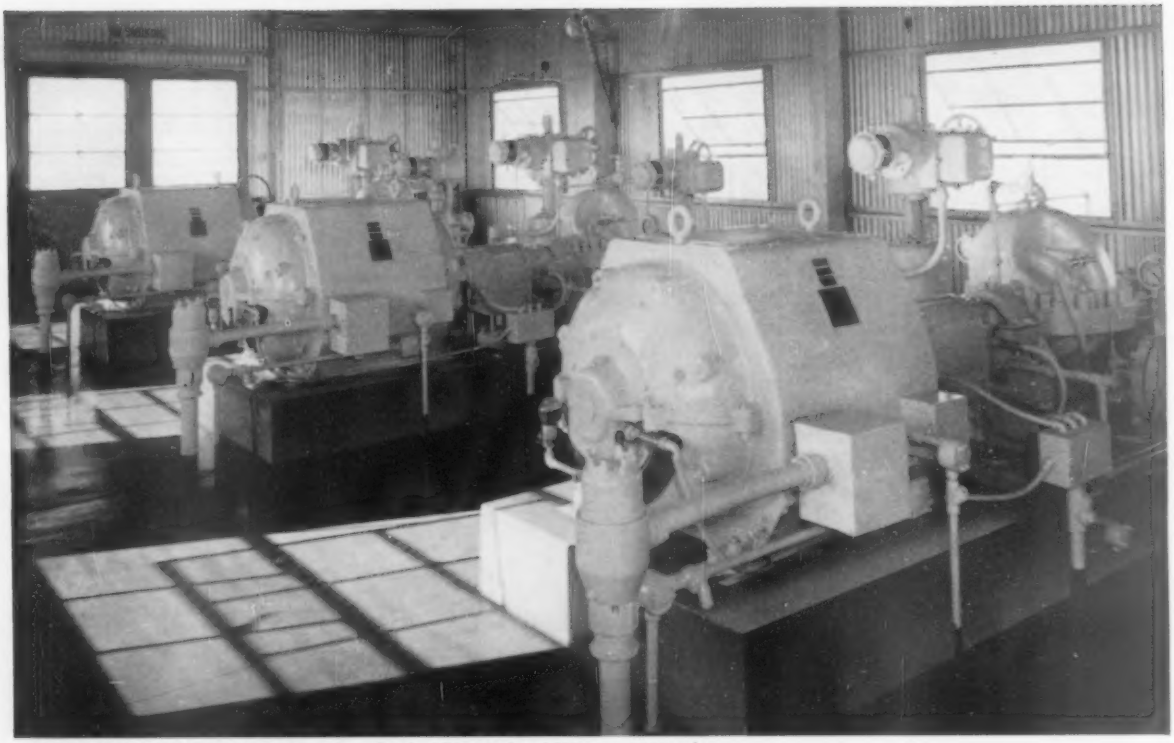
MISSION MANUFACTURING CO.

Mission E-Z Tubing and Casing Swabs are made in seven popular sizes (1½", 2", 2½", 3", 4½", 5½", and 7"). They are available through supply stores everywhere. Be sure to get a Mission E-Z Swab before your next swabbing job.

PESA

MISSION MANUFACTURING CO. • P. O. Box 4209 • Houston, Texas • Cable Address—"Missco" • Export Office: 50 Rockefeller Plaza, New York
In The United Kingdom: MISSION MANUFACTURING CO., LTD. • 17 Hanover Square • London, W. I. England • Cable Address—"Missoman"

SLUSH PUMP VALVES . PISTONS . VALVE SEAT PULLERS . LINERS . PISTON RODS . VALVE SPRINGS . GLAND PACKINGS . . SLIPS . SWABS . PLUG VALVES . CENTRIFUGAL PUMPS



DOWN IN CRESSON, TEXAS, three Louis Allis 500-hp, 3600-rpm, 2300-volt open motors drive centrifugal pumps at main-line station of a major oil company.

STATIONS STAY ON-STREAM

with Louis Allis Motors built to pipeline requirements

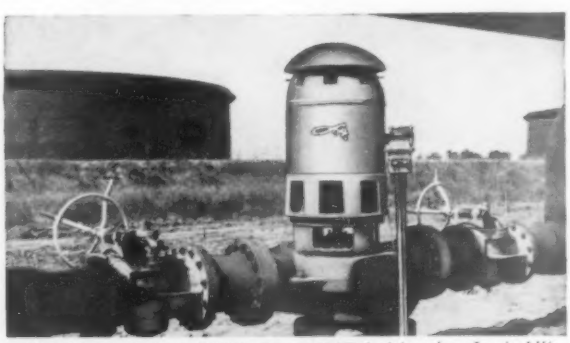
There is a Louis Allis Motor designed specifically for your pipeline job—one with long-life features that protect against costly downtime and maintenance.

Where a Louis Allis standard motor doesn't fill the bill exactly, you can get prompt delivery on a unit specially designed to give you the electrical and mechanical characteristics best suited to your needs.

Contact your nearby Louis Allis Field Engineer—or write us—for a solution to your motor problem, based upon our more than 50 years' experience.

THE LOUIS ALLIS CO.
MILWAUKEE 7, WISCONSIN

TRANSFER TERMINAL IN CORPUS CHRISTI is equipped with three Louis Allis 200-hp, 3600-rpm, 440-volt motors.



THIS VERTICAL BOOSTER PUMP is driven by a Louis Allis 350-hp, 3600-rpm explosion-proof motor.

cation drawings, anod photos of installations. **Write or call Layne & Bowler Pump Co., 2943 South Vail Avenue, Los Angeles 22, Calif., for Bulletin 1100.**

●

Detroit Diesel Petroleum Engines. A line of two-cycle power units for the oil fields is described and illustrated in a 16-page, 3-color brochure. It covers the new Turbopower models, diesel-electric sets, and single and multiple-engine units from 60 to 762 hp. Also covered are torque-converter models and marine-propulsion units for craft servicing offshore operations. **Write or call Detroit Diesel Engine Division, General Motors Corp., Detroit 28, Mich., for Detroit Diesel Petroleum Engines brochure.**

●

Industrial Insulations. Specifications for a line of spun-mineral-wool industrial-insulating products are presented in a new 20-page catalog. It lists standard sizes, thicknesses, and thermal conductivities for more than 20 types of heat and cold insulations for equipment and piping. It also includes temperature-thickness recommendations for each. The catalog describes typical applications and provides application instructions. **Write or call Baldwin-Hill Co., 500 Breunig Avenue, Trenton 2, N. J., for Industrial Insulations catalog.**

●

Solvay Products. A new comprehensive book contains detailed information on a line of alkalies and chemicals. This 68-page multicolor booklet includes data on the uses, markets, physical and chemical properties, packaging, handling, and storage of the industrial chemicals. **Write or call Solvay Process Division, Department PB, Allied Chemical & Dye Corp., 61 Broadway, New York 6, for Solvay Products book.**

●

Pipe Locators and Leak Detectors. The new 1957 catalog of M-scope electronic instruments includes M-scope pipe finders, two new transistorized leak detectors, and a new line of transistorized corrosion-control instruments. Water-well testing equipment is also featured. **Write or call Fisher Research Laboratory, Inc., Palo Alto, Calif., for 1957 catalog.**

●

Cleveland 80W Sidecrane-Backfiller-Tamper is a versatile three-way machine. It is covered in a new 12-page, 2-color bulletin. The one-man-operated 80W is a backfiller, pipelayer, and sidecrane with a 30,000-ft.-lb. capacity. Its rugged tamper also does a good compaction job that meets state and local-compaction specifications. The bulletin includes 28 on-the-job photos which demonstrate the 80W as it performs pipelaying, backfilling, and tamping. **Write or call Cleveland Trencher Co., 201000 St. Clair Avenue, Cleveland 17, Ohio, for Bulletin No. L-102.**

●

Alcotwin Heat Exchangers. Bulletin FH-3 describes and illustrates heat exchangers. The six-page, two-color booklet uses: (1) photographs, (2) engineering drawings, (3) dimension tables, and (4) coefficient and pressure-drop graphs. A list of sales offices is included. **Write or call Alco Products, Inc., 30 Church Street, New York 8, for Bulletin FH-3.**

●

Collet-Type Casing Packer and Landing Nipple. A two-page, two-color fact sheet explains a collet-type casing packer that can be run, set, and pulled on the tubing string or a sand line. It is useful where the packer must be moved often, or if the hole is crooked or directionally drilled. The fact sheet gives a cutaway drawing and critical dimensions. **Write or call Otis Pressure Control, Inc., 6612 Denton Drive, Dallas, Tex., for Collet-Type Casing Packer and Landing Nipple fact sheet.**

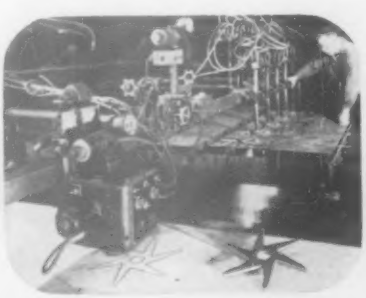
Three ways Ryerson can serve you

You know that Ryerson carries the world's largest steel stocks. And that every piece bears the Ryerson certified seal of high quality.

But did you know that there are other important ways Ryerson can serve you? Two of them are illustrated here: plastics and flame-cutting. Complimenting these services is our staff of specialists (men who know your industry's requirements) who work with you. So for *complete* service —call Ryerson.

STEEL FROM STOCK—Carbon steels, alloys, stainless—bars, structurals, plates, sheet and strip, tubing—you can get quick shipment of one piece or truckloads from the world's largest steel stocks, at Ryerson. Get the steel with the certified seal—of quality.

PLASTICS FROM STOCK—The convenience and dependability of Ryerson service is also available to buyers of industrial plastics—PVC pipe, valves and fittings, sheets and rods, rigid Kralastic pipe, flexible polyethylene pipe and tubing, etc.



FLAME CUT STEEL SHAPES—Your nearby Ryerson plant can quickly flame cut almost any shape from carbon, alloy or stainless steel—producing a single piece or thousands accurate to size and ready for your application. We take the work load—you save money.

RYERSON STEEL

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • WALLINGFORD, CONN. PHILADELPHIA • CHARLOTTE • CINCINNATI • CLEVELAND • DETROIT • PITTSBURGH • BUFFALO CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

EQUIPMENT MEN . . . in the News

J & L Managers Meet for Sales Talk

Administrative officials and district sales managers of J & L Supply Division participating in the fourth annual sales management conference held at the firm's Tulsa headquarters office, January 7-9 were:

Front row, seated, left to right: M. A. Park, H. L. Wilkins, J. R. Johnston, A. G. Bastian, P. R. Warner, R. D. Hilborn, L. G. Sutter, W. L. Wolfe, Rainey Elliott, R. J. Woods, Jr., H. H. Wilson, H. J. McAdams, W. O. Hardy, J. T. Batchelor.

Second row, left to right: H. D. Stanley, M. L. Eubank, H. H. Brown, W. R. Clarke, G. A. Pryor, F. A. Street, J. K. Guinn, D. H. Carson, G. A. McDaniel, V. H. Weldon, Jr., R. B. Putnam, G. E. Best, F. C. Bryan, J. W. Berry, G. A. Whiteker, E. A. Booth.

Third row, left to right: Frank DeWitt, F. L. McFarland, W. L. Vinson, C. H. Maxwell, A. G. Wehrley, C. A. Nicklas, H. C. King, D. T. Ottinger, U. G. White, Jr., R. Z. Dallas, O. M. Lorenz, J. A. Evans, Jr., W. R. Cooper, H. U. Everett, Henry Franks, O. A. Bergmann.

Top row, left to right: Bill Wood, W. J. Farwell, J. A. Tucker, H. B. Barbee, R. T. Bouldin, T. I. Estes, H. H. Ray, W. M. Douglas, A. A. Hopper, C. E. Rogers, C. R. Jones, F. W. Durbin, C. E. Bogle, Jack Judd, J. A. Carrigan, F. W. Birmingham, P. V. Edwards, and L. O. Bass, Jr.

Thirty-three field officials of J & L Supply Division convened at the firm's general headquarters office in Tulsa, January 7, for the fourth annual sales management conference. Attending the 3-day conclave from nine states and two Canadian provinces were district sales managers, assistant district sales managers, and sales office managers representing 17 sales districts and 8 sales offices in the United States and Canada.

Principal speakers for the opening-day lectures and discussions included: Rainey Elliott, president; W. L. Wolfe, vice president, sales; R. J. Woods, Jr., director of sales; H. H. Wilson, director, Gulf Coast operations; A. G. Bastian, manager, field sales division; J. T. Batchelor, sales manager, tubular products; W. O. Hardy, sales manager, general products sales; C. E. Bogle, manager, wire-rope sales; W. R. Clarke, manager, production - equipment sales; Jack Judd, manager, drilling-equipment sales; and J. A. Tucker, chief sales engineer, projects.

During the closing session the group heard talks delivered by guest speakers E. A. Booth, manager, tubular products, Jones & Laughlin Steel Corp., Pittsburgh; and Dr. Bernard Hanes, consulting psychologist, Cuyahoga Falls, Ohio.

National Tank Holds Sales Meeting

Pictured are key personnel attending a banquet during the recent sales meeting held by National Tank Co., Tulsa. Participating in the meeting were home-office personnel and representatives from branches in Arkansas, Colorado, Illinois, Kansas, Louisiana, Mississippi, Nebraska, New Mexico, North Dakota, Oklahoma, Texas, Wyoming, New York, and Canada. The sales meeting was conducted by Jay P. Walker, president; C. G. Wells, executive vice president; and A. W. Francis, Jr.: vice president in charge of sales.

DuPont Petroleum Chemicals Appoints Three Managers

William W. Wingate, Barrett B. Russell, and Richard O. Braendle have been promoted by the Petroleum Chemicals Division of E. I. du Pont de Nemours & Co., Inc. David H. Conklin, director of sales, made the announcement.

Wingate became assistant manager of the Mid-Continent region. He replaced Russell who is now assistant manager of the Gulf Coast region. Braendle replaces Wingate as additives manager for the Mid-Continent region.

Wingate has been with Du Pont since 1941. He has worked with the oil industry as a sales representative in the eastern and Gulf Coast regions.

Russell joined the company in 1950. He has been a sales supervisor in the central region and was assistant to the sales manager and additive sales coordinator in Wilmington.

Braendle joined Du Pont in 1944. Since 1949 he has worked in market development of new products for the Petroleum Chemicals Division.

Johnson Promoted to New B. S. & B. Automation Job

JOHNSON

Harry Lee Johnson, Jr., has been promoted to the newly created position of technical service, lease automation, of Black, Sivalls & Bryson, Inc. Floyd C. Myers, manager of sales and service, oil and gas division of B. S. & B., made the announcement.

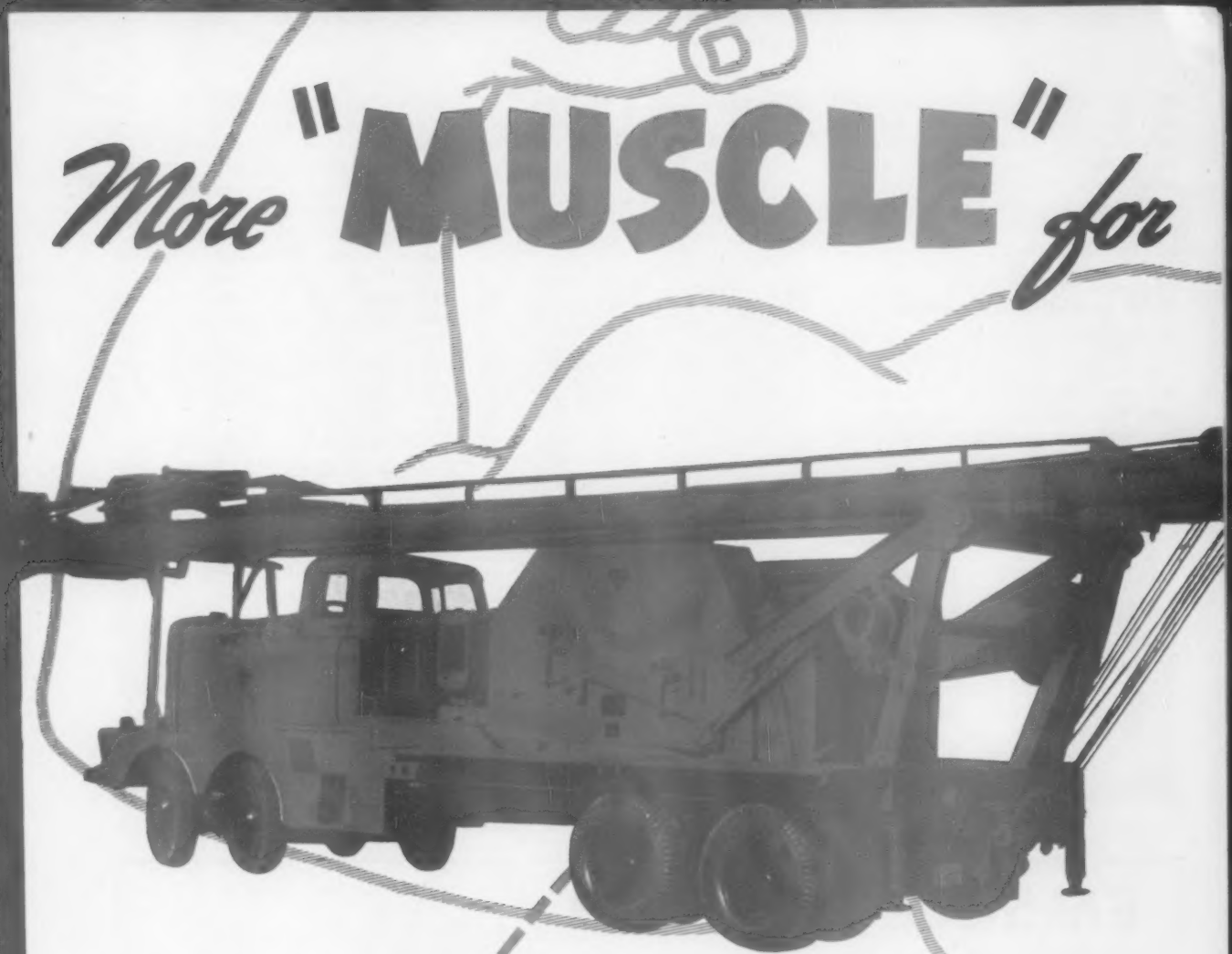
Johnson joined the company in 1954 after 8 years' experience as a turbine engineer with General Electric Co.

Orbit Valve Adds Three to Sales Force

Joe Schoeffler, Don DeSirey, and David Wolfe have become sales representatives for Orbit Valve Co., Tulsa, Okla. L. E. Wallace, general sales manager, made the announcement.

Schoeffler goes to Houston as industrial sales representative. he will work under the direction of Ralph H. Soape, district sales manager of the Gulf Coast area. Schoeffler will call on chemical plants, refineries, and gas-

More "MUSCLE" for



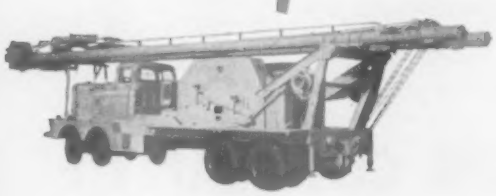
DEEP WELL WORK

Cooper Servicing and Workover Units to 300 h.p. are available to handle the *deepest* wells.

Cooper makes separate engine winches for truck mounting, winch tractors, truck powered winches, self-propelled units, rotary draw-works, rotary workover units and tailing-in spudders. In fact Cooper builds the most complete line of well servicing equipment.

There is a proper size and type to fit any depth well and any field condition.

Servicing and workover with Cooper units will be safer, faster and cost less.



Cooper MODEL T420-Double Drum Self-propelled Servicing and Workover Unit. A rugged machine for deepest servicing.

Tell us what you need to do and we will recommend a unit and send complete information.

FRED E. Cooper, Inc.

P. O. Box 1890 TULSA, OKLA.

Branches: Houston, Odessa, Los Angeles, Olney

Originator of Mobile Winch Units

oline plants. DeSirey will headquarter in Tulsa where he has been assigned to general sales work. Wolfe will be Orbit's field representative for southeastern New Mexico with headquarters at Hobbs. He will work under the direction of H. C. Sawyer, regional sales manager, Midland, Tex.

Pigg and Murray Moved By Bethlehem Steel

C. A. Pigg, formerly store manager and field representative at San Angelo, Tex., has been transferred with the same title to Graham, Tex. J. R. Murray, formerly field representative at San Angelo, Tex., has been promoted to store manager and field representative at that point.

Eggelhof Promotes Green

Wilson A. Green has been appointed district manager of Eggelhof Engineers, Inc., Dallas, Tex. Prior to his appointment, Green was a sales engineer in the main office at Houston.

New Telescoping Derrick Is Made of Aluminum

This telescoping derrick and its accessory well-servicing equipment are made mostly of aluminum. Weighing about one-third less than an all-steel

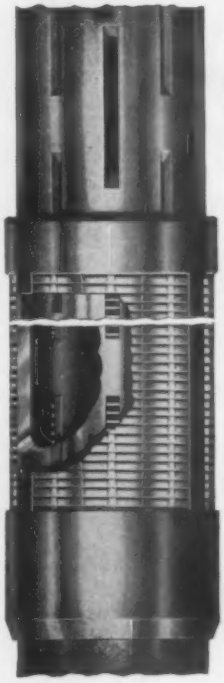
unit of similar capacity, it offers a solution to the problem of transporting such equipment over public highways. The portable unit was manufactured by Franks Division of Cabot Shops, Inc., Tulsa. It features an all-aluminum derrick, bed, winch frame, guards, cab, wheels, and truck bogie. It was developed by Franks engineers working with Reynolds Metals Co., supplier of the aluminum.

W. B. Woody, chief engineer for Franks, said that his firm and Reynolds are continuing work to further lighten and improve the units. The total height of the derrick assembly is 68 ft.; the folded length is 42 ft. 4 in. The unit's operating live capacity is 100,000 lb. It has been delivered to Phillips Petroleum Co. which plans to put it into operation at Vernon, Tex.

Continental-Emsco Appoints Dunaway to Distribution

Alton A. Dunaway has been appointed vice president of distribution operations of Continental-Emsco Co. Dunaway joined Continental Supply Co. in 1936. He served from 1951 as assistant credit manager and assistant treasurer. Dunaway's new duties involve the distribution of Continental-Emsco district and division operations in the United States and Canada.

EMSCO SLOTTED . . .



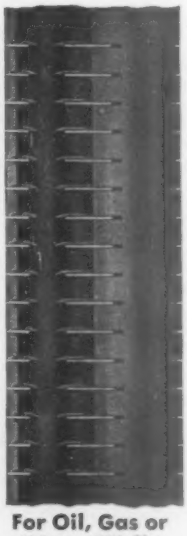
A SUPERIOR SCREEN FURNISHED IN A FULL RANGE OF SLOT GAUGES

With Emsco, the manufacture of slotted screen pipe is serious business. Our shop is equipped with machines designed especially for this purpose . . . machines that produce high quality slotted screen pipe, with slots ranging from .010 to .100 or larger if required.

We're proud of our facilities for producing this full range of slotted pipe. We're proud, also, of the record established by Emsco Slotted Pipe in wells all over the world. It retains 80% to 85% of the original collapse strength of the pipe . . . it may be spudded or rotated reasonably without damage . . . may be easily cut and pulled . . . and its V-shaped slots provide maximum drainage with minimum clogging. It's furnished, of course, in all popular sizes of pipe, to length as specified.

Emsco also manufactures "Vertical Slotted" Wire Wrapped Screen, with slotted openings that stay open longer, provide more drainage area per foot and retain 25% more strength than pipe with drilled holes with equal area.

For full information on Emsco "Slotted" and "Wire Wrapped" Screen Pipe, write for a copy of our latest catalog.



For Oil, Gas or Water Wells

EMSCO SCREEN PIPE COMPANY

3 RICKS ROAD **Phone JAckson 6-2609** **HOUSTON, TEXAS**

Export Representative: Val R. Wittich, Inc., 30 Rockefeller Plaza, New York 20, N. Y.

Personnel Changes Made By Baroid Division

C. Y. Vallance has been transferred from the Rocky Mountain area and he has been appointed district superintendent at Beaumont, Tex. and B. F. Stiba has been transferred and appointed sales representative in New Orleans area office for Baroid Division, National Lead Co. A. E. Milligan, formerly service engineer at Shreveport, La., has been appointed district sales representative in that area; and W. T. Sherman, service engineer at Lake Charles, La., has been transferred and appointed sales representative, West Texas area, with offices in Midland, Tex.

Dresser Manufacturing Appoints Stafford

Edwin O. Stafford has been appointed general markets sales representative for Dresser Manufacturing Division. H. Z. Hight, sales manager, made the announcement. Stafford will work out of Houston, Tex., covering the Texas Gulf Coast area. He was formerly employed by S. & L. Distributing Co. and American Flow Controls, both of Houston.

Ferguson Joins Dewey Supply

Laurence E. Ferguson has been appointed city sales representative for Dewey Supply Co., according to M. B. Roach, president. Before joining Dewey Supply, Ferguson was with Republic Supply Co.

Win-Well Appoints Two New Sales Representatives

Two firms have been added to the list of sales representatives for Win-Well Manufacturing Co., Los Angeles.

S. J. DURANT

R. D. TAYLOR

Win-Well makes a new 7-way multiport selector valve. The firms are Robert Taylor & Sons, Salt Lake City, and Durant & Associates, Casper, Wyo.

Robert Taylor & Sons is headed by La Mar Taylor, who is general manager. His partner is his brother, R. Derrill Taylor. The company will represent Win-Well in Utah, eastern Nevada, Idaho, western Montana, western Wyoming, western Colorado, and northwestern New Mexico.

Stuart J. Durant is owner of Durant & Associates. This company will handle sales and service for Win-Well in eastern Montana, eastern Wyoming, Colorado east of the Divide, and the western one-third of North Dakota, South Dakota, and Nebraska.

U. S. Steel Makes Morava Head of Supply Division

Appointment of John H. Morava as president of United States Steel Supply Division of the United States Steel Corp. was announced by Clifford F. Hood, president of United States Steel.

Morava succeeds Leslie B. Worthington, who was recently made president of Columbia-Geneva Steel Division in San Francisco. Morava moves to his new post from the position of manager of sales of U.S.S. Chicago district sales office. His business career with U.S.S. started in 1930 as a sales student at the South Works plant in Chicago, and he was alloy mill foreman there before moving into the Chicago headquarters-office sales organization. After he served in various capacities he was made manager of sales of the Chicago district office in 1955.

From the swivel to the bit...

Jet-Lube Double Duty "21" TOOL JOINT COMPOUND

Outperforms all Medium Cost Compounds!

EXCLUSIVE FORMULA contains *four* anti-seize and low friction components . . . metallic lead, flake copper, graphite and molybdenum disulphide (MoS_2).

JET-LUBE "21" is a *multi-purpose* compound for all types of service including high torque and excessive weight conditions in hot, deep and high pressure holes. Exceptional results in high angle drilling, underreaming, breaking in new tool joints, etc. Non-melting; brushable and pumpable to −40°F. Will not settle out, nor work harden or compact in thread roots.

See Composite Catalog or write for literature.

PERFECT SEAL PREVENTS WASHOUTS

FAST, LOW FRICTION MAKE UP & BREAK OUT

CUTS THREAD WEAR

SUPERIOR ANTI-SEIZE PROPERTIES

IMPROVES AUTOMATIC BREAKOUT & POWER TONG OPERATIONS

SPEEDS UP ROUND TRIPS

Give Your Joints a GOOD break!

USE JET-LUBE® "21"

In the U.S.A. & Canada SOLD EXCLUSIVELY THRU SUPPLY STORES

MANUFACTURED UNDER U.S. PAT. NO. 2,543,741

MAIN OFFICE: 3093 N. California St., Burbank, Calif.
EXPORT OFFICE: 46th Floor, 30 Rockefeller Plaza, N.Y. 20,

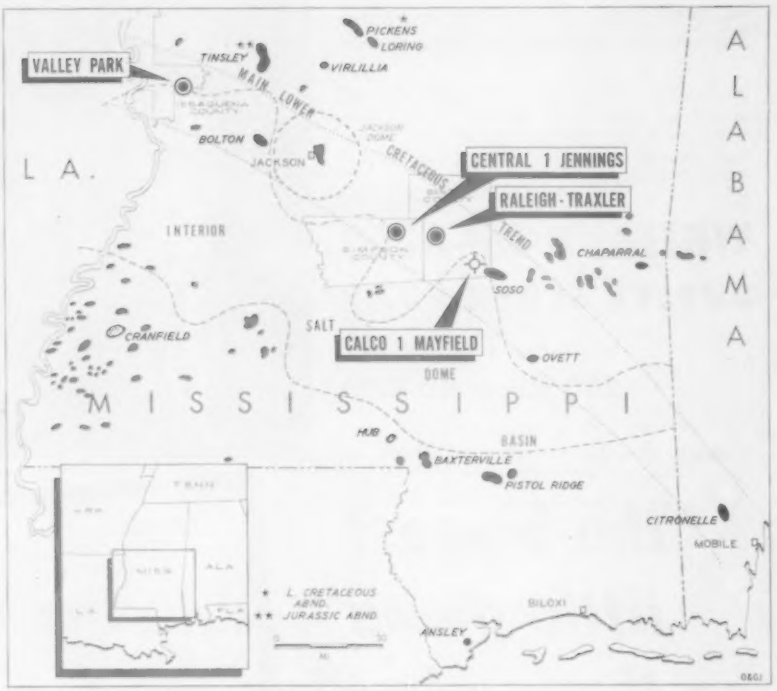
LICENSED MANUFACTURERS:
Jet-Lube of Canada, Ltd., Edmonton, Alberta
Jet-Lube (Australia) Pty, Ltd., Perth, W. Australia
Jet-Lube Ltd. (England), Wolverhampton & London

CORE ANALYSIS
ENGINEERING and CONSULTING
RESERVOIR FLUID ANALYSIS
SPECIAL CORE ANALYSIS
WELL LOGGING
RESEARCH
Six departments performing 22 specific services designed to discover and recover more oil . . .
CORE LAB
PETROLEUM RESERVOIR ENGINEERING

MISSISSIPPI has two important new fields in the Lower Cretaceous trend that sweeps 150 miles from Valley Park in the northwest to Alabama's growing Citronelle field in the southeast.

by Frank J. Gardner

Mississippi Braces for New Search



Two strikes forge new links in deep Cretaceous chain

SOUTHEASTERN oil operators for the past few years have been forging a chain of Lower Cretaceous oil fields across the waist of Mississippi. First and strongest link in the chain was Soso field, found in 1953. In 1954, an equally important strike was made at Bolton, and in 1955, the chain was firmly anchored at Citronelle, in southwestern Alabama.

A broad arc . . . The broad arc connecting Bolton and Citronelle sweeps through 150 miles of potential oil country. It's deep-drilling country, but the rewards are worth going after. Soso's 88 Lower Cretaceous wells are producing 12,000 bbl. a day from the Rodessa and Sligo-Bailey; Bolton has 26 wells producing 3,500 bbl. daily from Paluxy and Mooringsport, while Citronelle's 52 Rodessa wells are making 8,000 bbl. per day. Depth of production ranges from 10,000 ft. at Bolton to 11,900 ft. at Soso.

In November 1956, Amerada Petroleum Corp. et al added 30 more miles to the trend at its northwestern end. The discovery well at Valley Park field, the 1 Delta Wildlife & Forestry, Inc., pumped 71 bbl. per day from Mooringsport at 6,270 ft. The yield didn't hold up well, and by year's end, was down to 19 bbl. daily, but this strike did give Issaquena County its first field, and linked Mississippi's Lower Cretaceous trend with that of northern Louisiana.

Adds two new fields . . . Now, 1957 has seen two important new fields discovered in the middle of the Mississippi trend. The first of these was The California Co.'s 1 Central Oil Co. "5," discovery well of Smith County's new Raleigh field (Section 33-2n-7e). Finished on January 4, this one flowed 266 bbl. per day on 10/64-in. choke from Sligo-Bailey perforations at 11,692-11,703 ft. This is the principal pay zone at Soso, only 20 miles southeast.

The California Co.'s success at Raleigh was a hopeful follow-up to two 1956 dusters drilled 7 miles northwest of Soso field; these, the 1 Johnson (abandoned February 15) and the 1 Mayfield (abandoned June 7) both gave good shows and were exhaustively tested before they were given up. But the company was encouraged enough to try again at Raleigh.

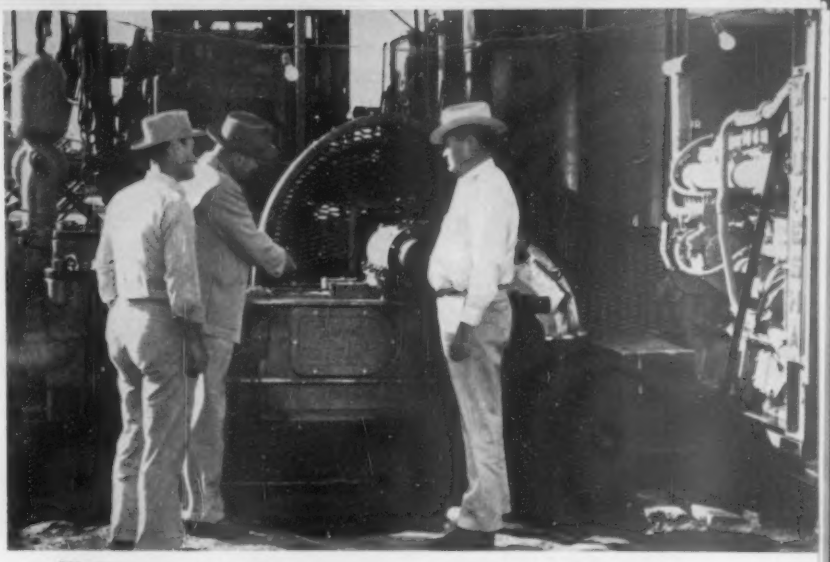
Last week, the newest trend field was discovered in Simpson County, Mississippi. Central Oil Co. 1 Jennings, in Section 23-2n-5e, was shut in for storage after flowing 9 bbl. of 44°-gravity oil per hour through 9/64-in. choke from Sligo-Bailey perforations at 12,396-12,404 ft. Central found 24 ft. of Bailey sand in this well at 12,383-12,407 ft. This would make it the deepest horizon yet to be commercialized along the Lower Cretaceous arc.

These two new fields are the best evidence yet that this long belt of Lower Cretaceous hunting ground is an important target for future drilling. This year, and 1958, should produce at least 50 more wildcats between Citronelle and Valley Park. Every important discovery along the trend has set off a new burst of leasing activity; these two will be no exception, but the Citronelle play, the Soso play, and the Bolton play left little open acreage in between.

And should hide more . . . For many years, geologists have held that the deep Mesozoics of Mississippi and Alabama should hide many a good oil field. Not only the Lower Cretaceous, but the Jurassic rocks as well should be classed as major targets for oil finding. The Smackover and other Jurassics have been identified and have yielded oil and gas at several places in both states. The chief deterrents have been depth and difficulty of geophysical detection, but these are slowly being overcome, and the next 5 years should see the chain of fields extended and filled in. **End.**

In 11 months' continuous operation, no down time and no expense on this Dependable Wheland HP-8000 Pump !

Installation view of the Wheland HP-8000 owned by Virgil Taylor Drilling Co., Gainesville, Texas. Left to right: Mr. Woody Atkins, Tool Pusher; Mr. Virgil Taylor; Mr. Walter Smith, Drilling Supt.



WHELAND HP-8000
DUPLEX SLUSH PUMP
7¼" x 12"
220 HP at 70 RPM

Known throughout the oil fields as

"the biggest little pump on the market"

"We are happy to recommend the Wheland pump," says owner operating his second.

"Since . . . last January . . . have been running this pump within 10% of its efficiency. We have had no down time and no expense . . . during this time."

Wheland builds a Complete Line of Efficient Slush Pumps. **Write for Descriptive Bulletins.**

VIRGIL TAYLOR
NO 5-3061

WALTER L. SMITH
NO 5-4554

H. R. THECK
NO 5-4546

VIRGIL TAYLOR DRILLING COMPANY
PHONE NO 5-3131
POSTOFFICE BOX 76
GAINESVILLE, TEXAS

November 15, 1956

Mr. Gordon P. Street, President
The Wheland Company
Chattanooga, Tennessee

Dear Mr. Street:

We purchased a Wheland HP-8000 Pump last January which has been in continuous operation since that time. We have been digging wells from 3,500 to 5,000 feet and have been running this pump within 10% of its efficiency during this work. We have had no down time and no expense against this pump during this time.

We had one of your old-style HP-11000 Wheland pumps in operation for a period of seven years. It is surprising to realize the amount of hole that it did with very small expense. We are happy to recommend the Wheland pump.

We operate two rigs in North and West Texas and in Southern Oklahoma, digging wells from 2,000 to 8,500 feet. We do contract drilling, take interest deals and drill for our own account.

Yours very truly,

VIRGIL TAYLOR DRILLING COMPANY

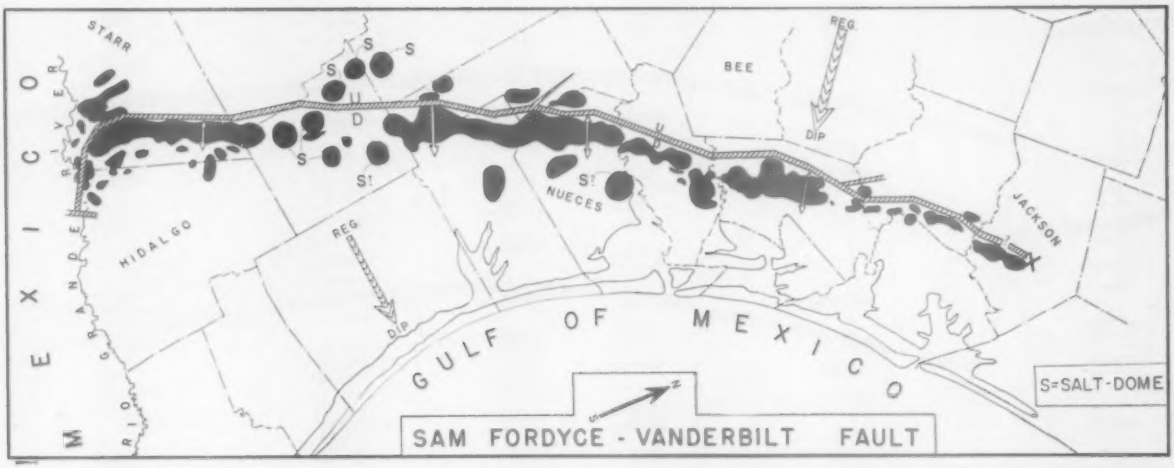
By Virgil Taylor
Virgil Taylor

WHELAND
ROTARY DRILLING MACHINERY

THE WHELAND COMPANY
CHATTANOOGA, TENNESSEE, U.S.A.
DRAW WORKS • SLUSH PUMPS • ROTARIES
CROWN BLOCKS • TRAVELING BLOCKS • SWIVELS

DOMESTIC DISTRIBUTORS: INDUSTRIAL SUPPLY COMPANY, INC.—Main Office: Wichita Falls, Texas • HOUSTON OIL FIELD MATERIAL COMPANY, INC.—Main Office: Houston, Texas • JONES AND LAUGHLIN STEEL CORPORATION, SUPPLY DIVISION—Main Office: Drawer 2481, Tulsa 2, Oklahoma.

EXPORT DISTRIBUTORS: LUCEY EXPORT CORPORATION—233 Broadway, New York 7, New York—Broad Street House, London, E. C. 2, England.



SOUTH TEXAS' GOLDEN LAND . . . 115 fields that have produced over 1 billion barrels of oil and may contain 2 billion more. Fig. 1.

In the Sam Fordyce-Vanderbilt system . . .

Operators Follow 240-Mile Turnover

by John W. Honea

THE Sam Fordyce - Vanderbilt fault system necessarily includes the great turnover or anticlinal feature that is found roughly paralleling the fault system throughout its definable limits since it is the turnover, and not the faults, that is of the greatest interest to the oil operators. This important anomaly extends across South Texas about 240 miles with the area of influence varying from ½ mile to 10 miles in width. The turnover is present in some form throughout most of the 240 miles, although of course various saddles and branch faults break it into separate segments.

Fig. 1 indicates the relative location of the fault, the trend of production, normal regional dip, reverse dip into the fault, and the locations of known or suspected deep-seated salt domes. Along this golden lane, there are approximately 115 distinct oil or gas fields which have produced over 1 billion barrels of oil and contain possibly 2 billion barrels in reserve.

Accurate data on gas production and reserves are not available, but the present rate of gas production is very high with hundreds of known gas sands remaining untested.

The author is district geologist, The Texas Co., San Antonio, Tex. Paper was prepared primarily for oral presentation to the management of The Texas Co. It was presented at the sixth annual meeting of the Gulf Coast Association of Geological Societies at San Antonio, 1956.

Theories of origin . . . The fault, or fault system, is downthrown to the coast, with the displacement varying from questionably there at all to over 3,000 ft. Naturally, there are several different theories of origin of the features, but the generally accepted theory is that of faulting being contemporaneous with sedimentation, a theory principally based on the greater thicknesses of formations on the downthrown block as compared to applicable formations on the upthrown side. At this time, this theory will suffice but will be discussed later in this article.

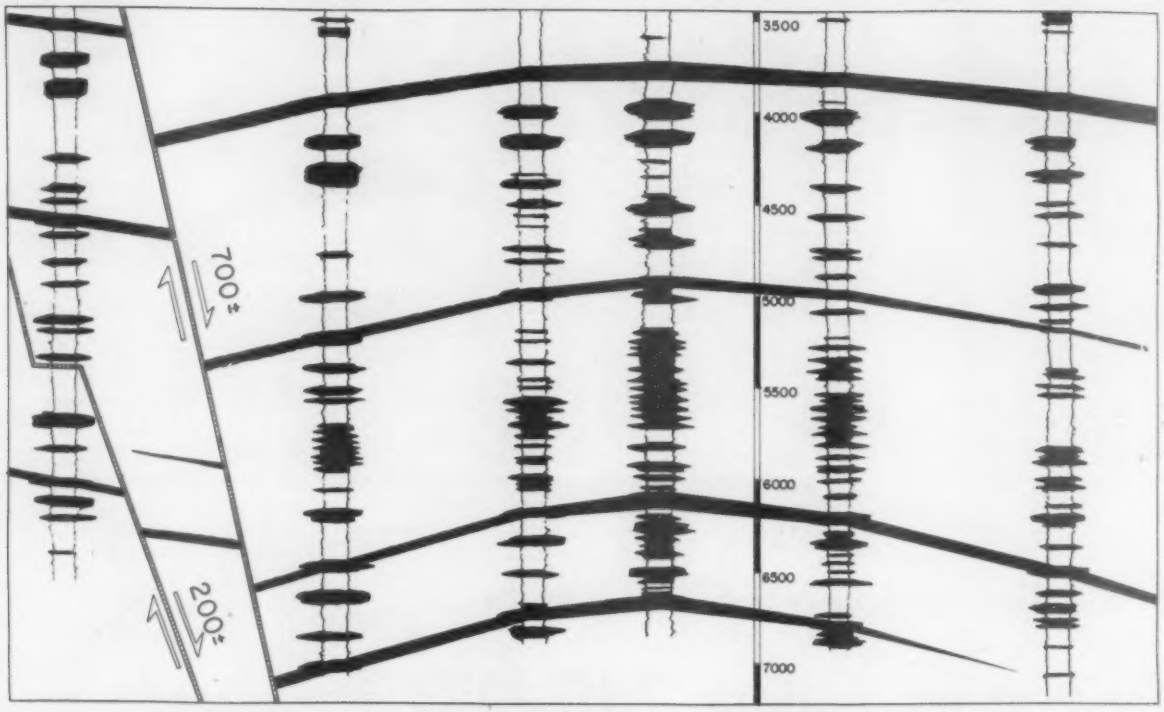
Affected by the turnover are the prolific Miocene and Oligocene sands adequately separated by shales from a depth of 2,000 ft. to below 10,000 ft. It is from this trend that the so-called non-Marine Frio sands gained their importance in the ranks of oil and gas producers. Nomenclature of the stratigraphy may vary considerably between individuals and companies, but in this article, the non-Marine Frio is intended as that section found below the Anahuac formation where present and above the Vicksburg as designated by the Textularia warreni.

The non-Marine Frio along this trend is composed of fine to medium-grained porous, permeable unconsolidated sands separated by frequent shales and containing no fossils of any kind. This section has accounted for over 80 per cent of the total production along this trend and is from 3,000 to 8,000 ft. thick.

The Fleming group of the Miocene and the Anahuac produces to some extent in the central-northeast portion of the anomaly while the Vicksburg produces to the south.

Development wells . . . Minor faulting, formation wedging forming stratigraphic traps, erratic sand lensing, and various structural adjustments forming saddles and indulations of beds all combine to render this vast regional feature the ideal hunting ground for the oil operator. Development wells are constantly being drilled in proved fields and wildcats are continually probing the flanks and undrilled areas, searching for one or more of the various types of traps common to the trend.

Fig. 2 indicates a slightly pencil-engineered cross-section across Agua Dulce-Stratton field from east to west,



CROSS-SECTION across Agua Dulce-Stratton field from east to west including the major fault. Fig. 2.

and includes the major fault. This section is not intended to be entirely accurate but merely to illustrate the typical reverse dip into the fault, the slight thickening of formations near the fault, greater sand deposits near the crest, and the positions and thicknesses of the sands and shales.

It is important to note in this field, as in many others, there is a greater percentage of sand on the crest than near the fault even though the actual formations thicken to some extent toward the fault. It is admitted that this cross-section would not be typical of a similar one in the southern portion of the turnover where increased sand deposits are noted near the fault.

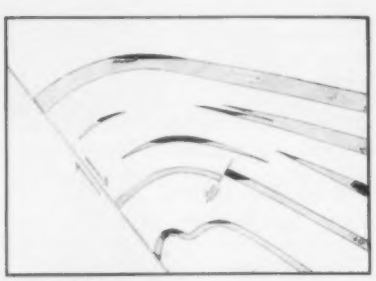
Fig. 3 includes the common types of traps of the region, and is not meant to refer to any one specific area. The normal anticline or gently folded sand is the most-important type of reservoir, but millions of barrels have been produced from the stratigraphic traps, shoe-string sand lenses, fault traps, and the less-common double-lobed anticline, a feature which may be the result of compaction forces.

In this region, without doubt the biggest problem is acquiring leases. There are no open tracts. However, in the event that a drilling block can be scrounged out of some independent or major, such factors as unsuspected faulting and unpredicted saddles or lows may show up and create problems.

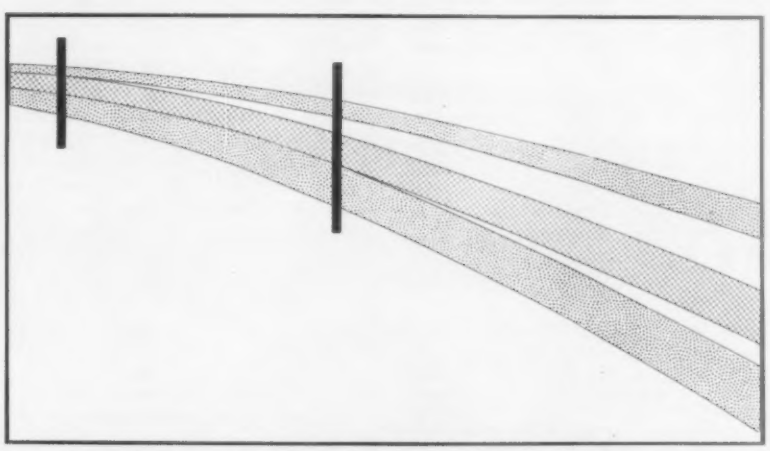
Correlation of electric logs is not too difficult, but seismic reflections generally must come from phantom horizons which could result in the overlooking of very small-scale faulting or formation warping.

The wedging of beds updip along the east flanks of the anomaly, especially shale sections, frequently cause false fault detection. Fig. 4 illustrates this worrisome wedging to some extent. The well updip does not penetrate all beds found by the downdip test; thus a fault is suspected. Subsequent wells will of course clarify the situation.

Accepted theory . . . For some reason, geologists always seem to want to know



SOUTH TEXAS' most-common types of traps. Fig. 3.



WEDGE EFFECTS of beds updip along the east flanks of the anomaly. Fig. 4.

WORLD WIDE EXPLORATION FOR PETROLEUM

6200 East Forty-first Street In Tulsa

SSC's New international headquarters...
with the most modern facilities...
for conducting world-wide exploration...
wherever oil must be discovered...

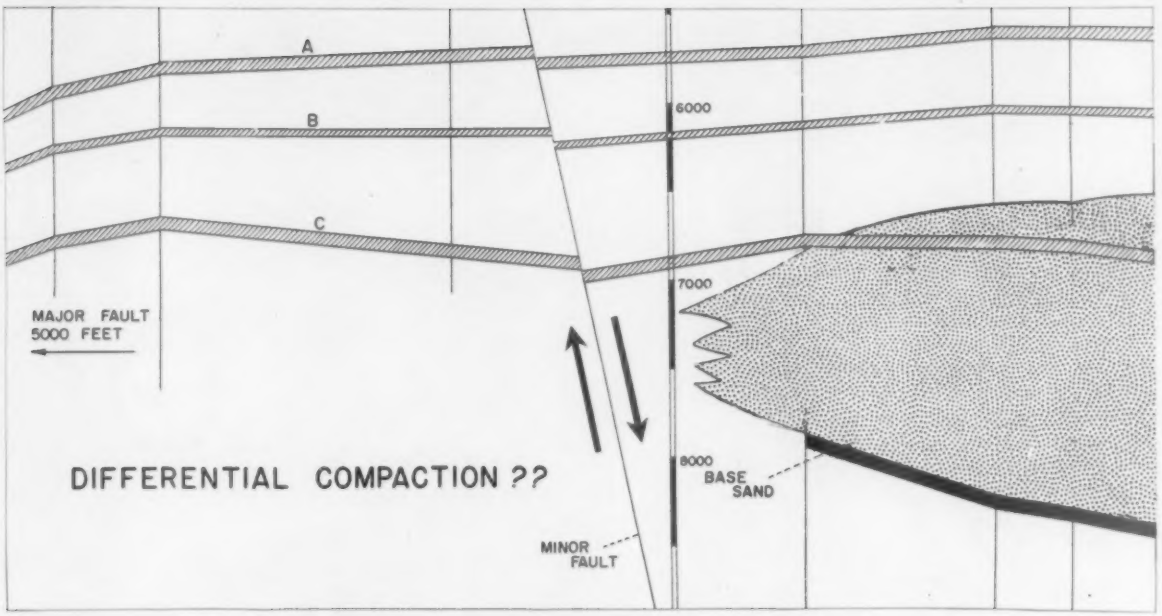
Our 26th Year

WORLD-WIDE SUBSIDIARIES

• SSC of Canada • SSC of Colombia • SSC of Mexico • SSC of Bolivia
• SSC of Venezuela • SSC International • Seismograph Service Limited of England
• Seismograph Service Italiana • Compagnie Francaise De Prospection Sismique

Seismograph Service Corporation P.O. BOX 1590, TULSA, OKLAHOMA, U.S.A.

SEISMIC — GRAVITY AND MAGNETIC SURVEYS — LORAC — CONTINUOUS VELOCITY LOGGING



SECTION of key correlation points taken across La Rosa field. Fig. 5.

why something takes place regardless of whether or not the solution is of economic value. Therefore, many theories as to the origin of this major anomaly, including both fault and turnover, have been presented. The most widely accepted theory is that the faulting was contemporaneous with deposition. Other well-known theories are the Hinge line theory, the slip-plant theory, and the salt-ridge theory. When investigated closely, all of the theories seem to have definite merit and appear to fit at some place along the fault trend.

Actually, it is my opinion the anomaly is a result of the cumulative effect of all the theories thus far proposed, and that in some locations, a specific theory may stand out as being the major factor. I am adding another theory that has rarely if ever been considered as a major factor in our South Texas geology.

I do not believe it is the sole reason of origin of this feature, nor even the greatest contributor to the cause, but I definitely believe it to be a very major factor over-all, and in specific areas may be the prime factor. I believe that differential compaction contemporaneous with deposition figured strongly in the formation of this anomaly and a large number of other structures throughout the Gulf Coast region.

By this theory, I mean that as the sediments were deposited, particle by particle, inch by inch, foot by foot, the shales, or oozes at the time of deposition were compacted more so than were the equivalent aged sands. With progression of a geologic time in which the shorelines or areas of sand depositions remained fairly constant, or with little fluctuations, this small-scale differential compaction would be increased to large proportions sufficient to cause faulting and turnover or both.

At the same time, it is apparent that as the magnitude of the process increased, other factors would become involved until such time that all proposed theories would be working together on such an anomaly as we have here. There are several places along the trend under discussion which appear to bear out the compaction idea, and certainly there are many local features that must surely have been caused by differential compaction. Small faults, undulations, and saddles of anticlines could easily be the result of compaction.

Key points . . . Fig. 5 is not intended exactly as a cross-section, but more of a section of key correlation points taken across La Rosa field area of Refugio County. The lower correlation band denotes the base of a sand body that decreases in thickness from east to west more than 1,000 ft. over a distance of 6,300 ft. Apparently the sand completely shales out before reaching the next point of control.

It is more than coincidence that the correlation band across the top of the sand dips sharply to the west in the area having a paucity of sand. Compaction apparently could not absorb all pressures and movements; thus the small fault originated. Exclusive of the fault displacement, the top band does not reflect the double-lobed anticline as does the lower band. This indicates that at shallower depths, the overload is less and compaction has not progressed to the point of flexing the more recent beds.

And with this in mind, the answer is found to the question often arising as to how a fault can be of small displacement at shallow depths, greatest displacement at medium depths, and diminish at greater depths. Differential compaction starts it, other factors such as rate of deposition, type of deposits, transgression and regression limits of shorelines, and resistance of underlying material including basement complex get into the act. They aid compaction until a point or time is reached at which the overload is not sufficient to require any more relief and the fault disappears.

Regardless, the varied structure found along this trend certainly indicates a variety of forces have been at work, some exceeding others in certain areas, but all of great importance and any specific area should be closely studied before making a guess as to "how did this happen like this?"

At one time, a certain geologist had a black sheep in a flock of white ones pointed out to him by a traveling companion. The geologist replied that "at least he is black on one side." The moral, in geology—always analyze something from all sides before making a statement.

Five Strikes Put Paradox Up Front

by John C. McCaslin
District Editor

THE Paradox basin, a newly emerged oil giant, is fulfilling its promise to be the nation's No. 1 exploratory province in 1957. With just 1 month gone in the new year the southeastern Utah basin already boasts five new oil and gas discoveries, 25 active locations, and new locations popping up too fast to count.

As a wildcat attraction the basin is just about 1 year old. During 1956 the Paradox country gained drilling momentum as the weeks went by—Aneth, Bluff, North Desert Creek, Hunav, Toh-Atin, Bita Peak, and East Aneth fields were opened. Oil finders swarmed into this all-but-forgotten evaporite basin, land prices rose, and fast development of the new discoveries began in earnest. The score at the end of 1956 in the Paradox basin:

Total fields (as of January 1)—16

. . . Aneth Trend reserves estimated at 100 to 300 million barrels.

Here's what happened in January:

. . . **Gulf Oil Corp.** opened the most westerly production in the Aneth trend at its 1 Desert Creek-Indian, 3½ miles southwest of Recapture Creek field. This western anchor well flowed 263 bbl. of oil per day on 12/64-in. choke from perforations in the Paradox-Pennsylvanian at 5,800-10 ft. A second well, 2 Desert Creek-Federal, is drilling.

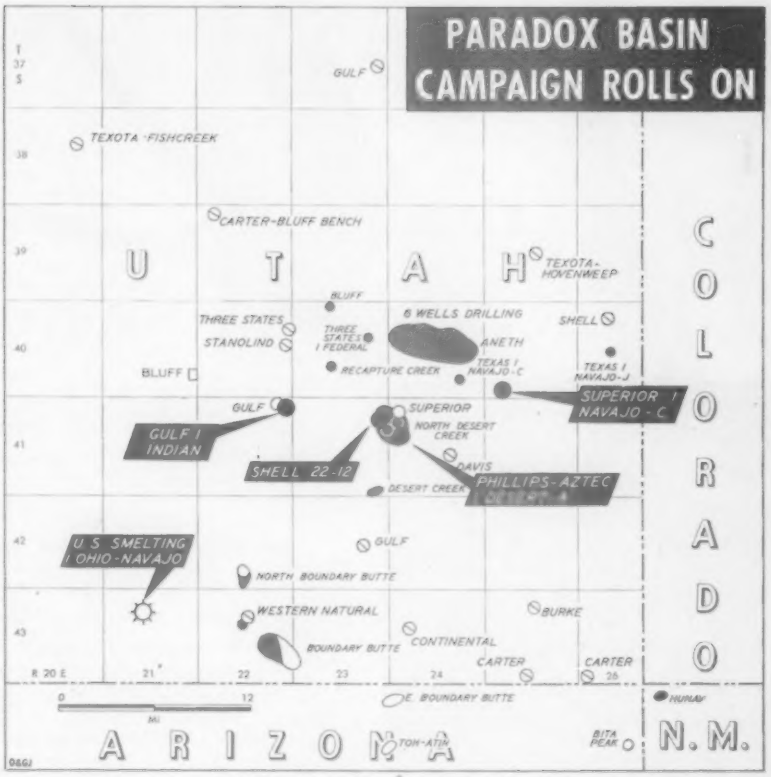
. . . **Superior Oil Co.** opened a new Paradox oil field 3 miles southeast of the south side of main Aneth field at 1 Navajo-C. Information on this well is being held back due to land litigation between the State of Utah and the Navajo Indians. This well is the first producer in R25e.

. . . **U. S. Smelting,** Refining & Mining Co.'s 1 Ohio-Navajo, 6½ miles west-northwest of North Boundary Butte, is a shut-in Hermosa-Pennsylvanian gas discovery well. This southwesternmost well in the basin flowed gas at the rate of 9,500 M.c.f. per day on early test at 4,842-4,910 ft. Only one well has been drilled in the barren area between the 1 Ohio-Navajo and North Boundary Butte. Tests in the Paradox at this well got 78 bbl. of oil in 10 hours, swabbing, at 5,035-70 ft.

. . . **Phillips Petroleum Co.** and Aztec Oil & Gas Co. 1 Desert-A, a long extension to North Desert Creek field, flowed 631 bbl. of oil in 6 hours on 1-in. choke; 410 bbl. on 25/64-in. choke in 10 hours. This southeast offset discovery is one of the best wells in the Paradox campaign.

. . . **Shell Oil Co.** 22-12 North Desert Creek flowed at the rate of 720 bbl. of oil per day on drill-stem tests of the upper Hermosa-Pennsylvanian at 5,275-5,340 ft., opening a new pay in the field which produces from the Paradox.

Shell's well is ½ mile northwest of other wells in the field. North Desert Creek has four producers — **Shell 1 North Desert Creek,** the discovery well, flowed 1,440 bbl. per day from Paradox at 5,578-86 ft.—**Superior Oil Co. 1 Navajo-B** flowed 1,402 bbl. per day from the Paradox at 5,607-36 ft.—and, **Phillips-Aztec 1 Desert-A** (see above).



The Paradox basin is now the nation's No. 1 oil-hunting province. This newcomer to the nation's oil coffers will see plenty of action in 1957.

And Now What?

Drilling momentum in the Paradox basin is keeping well ahead of the map-watchers. The Aneth trend itself is more than 20 miles long, and will con-

Southeastern Utah Scoreboard—January 1957

- Five discoveries (four oil, one gas)
- 25 Active locations

New Pennsylvanian Producers

1. U. S. Smelting, Refining & Mining Co. 1 Ohio-Navajo, SE NW NW 9-43s-21e, San Juan County. IP 9,500 M.c.f. of gas per day, Hermosa 4,842-4,910 ft.
2. Superior Oil Co. 1 Navajo-C, SE SE SE 31-40s-25e, San Juan County. Paradox oil discovery. Details not available.
3. Phillips-Aztec 1 Desert-A, SE NW NW 18-41s-24e, North Desert Creek field extension, San Juan County. IPF 105 bbl. of oil per day, Paradox at 6,039-57 and 6,064-73 ft.
4. Gulf Oil Corp. 1 Desert Creek-Indian, C NE NE 1-41s-22e, San Juan County. IPF 263 bbl. of oil per day. Paradox at 5,800-10 ft.
5. Shell Oil Co. 22-12 North Desert Creek, C SE NW 12-41s-23e, San Juan County. IPF 720 bbl. of oil per day, upper Hermosa 5,275-5,340 ft.

HOMCO SUPPLY STORES

HOMCO does the job

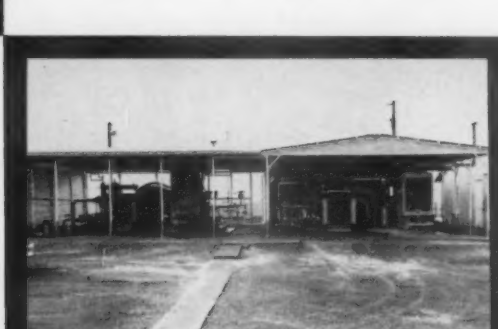
supply and service in the roughest country

HOMCO portable gas compressor units have been designed for use in locations where moderate quantities of gas must be compressed for purposes such as gas lifts, injection, transmission lines and the like.

HOMCO portable gas compressor units are outstanding in performance, portability, flexibility and economy.

ALL HOMCO units are complete with necessary jacket water coolers, gas coolers and gas scrubbers. All piping between the component parts is supplied and mounted in HOMCO'S manufacturing plant in order that the units will be ready for immediate service upon reaching their destination.

HOMCO will furnish compressors to fit any individual specification.



HOMCO Export Offices

Houston Oil Field Material Company, Inc.,
509 Madison Avenue
New York City, New York

HOMCO de Mexico, S. A.
Edificio Reforma - Versalles
Paseo de la Reforma # 76, desp. 503
Mexico 6, D. F.

HOMCO
HOUSTON OIL FIELD MATERIAL COMPANY Inc.

HOUSTON, TEXAS

THE OIL INDUSTRY'S MOST COMPLETE SERVICE

MEMBER A.A.O.D.C.

RESEARCH — DEVELOPMENT — ENGINEERING — MANUFACTURING

tinue to grow at both ends and in the middle. There is nothing to prevent this intensified oil search from moving into southwestern Colorado. The east anchor to Aneth is just west of the state line. Two gas fields were opened in Arizona last year. We can look for more gas exploration in this southern rim area of the basin. Humble Oil & Refining Co. opened an oil field in the northwestern corner of New Mexico's portion of the Paradox basin last year. This should stir up some wildcats in this area.

The Paradox basin is the largest of the three basins in the Four Corners region. It is also one of the country's still-virgin territories in which to hunt for oil and gas. The Aneth discovery taught us a strat-trap lesson for the future. The industry is learning how to find strat traps by use of facies and stratigraphic studies. This new outlook and the resounding oil success in the Paradox basin is a guidepost to other vaguely looked-at prospects. One thing is certain—the nation has a new prolific source of oil in the Paradox. Big things will happen in the Four Corners this year.

Exploration This Week

Appalachian	179
California	179
Canada	179
Kansas	184
Louisiana	185
Michigan	186
New Mexico	186
Oklahoma	189
Rocky Mountain	193
Texas	194
Successful Wildcats	194

EXPLORATION HIGHLIGHTS

APPALACHIAN

OHIO

An extension of ½ mile to Sandyville field was completed by East Ohio Gas on 1 Dorothy Adams, Section 16, Bethlehem Township, Stark County. White Clinton at 4,301-25 ft. gaged 1,100,000 cu. ft. natural and 3,050,000 cu. ft. after fracture.

● Fracturing proved helpful in opening up a new area south of Perryton pool in Jackson Township, Muskingum County. Cannon Oil & Gas 1 (2) A. E. Van Dyke, Section 14, drilled near three very small wells, made 150 bbl. in a 24-hour test after treating Clinton, found at 3,151-95 ft.

● Holl Brothers 1 S. T. Billingsley, Section 4, Falls Township, Hocking County, a semiwildcat ¾ mile south of a single small producer, topped the Clinton at 2,698 ft. and finished in sand at 2,728 ft. After fracture, the well gaged 200,000 cu. ft. gas and 40 bbl oil in 24 hours.

PENNSYLVANIA

In Young Township, Indiana County, southwest Pennsylvania, Manufacturers Light & Heat Co. 2 R. & P. Coal Co. (Neal), wildcat, gaged 1,812,000 cu. ft. gas after fracture, chert 7,473 ft., gas 7,527-40 ft., Oriskany sand 7,616-35 ft., gas 7,618 ft., Helderberg lime 7,635 ft. Total depth 7,711 ft.

WEST VIRGINIA

In St. George district, Tucker County, West Virginia, Columbian Carbon Co. 1215 U.S.A. Dept. of Interior wildcat, elevation 1,639 ft., was dry after fracture. Chert 3,390-3,446 ft., gas show 3,415-46 ft., Oriskany sand 3,544-3,688 ft. Total depth 6,387 ft.

● Glade district, Webster County, this company's 1-1241 The Gauley Co., elevation 2,265 ft., was also dry. Big Lime 1,550-2,040 ft. Total depth 4,960 ft.

EASTERN KENTUCKY

On Beefhide Creek in the Pike County sector of Big Sandy gas field, Kentucky West Virginia Gas Co. completed 6315 Smith Mullins as a combination oil and gas well. An initial potential of 75 bbl. of oil daily accompanied by an open flow of 350,000 cu. ft. of gas daily was recorded from the Mississippian Keener sand section 3,030 to 3,087 ft. total depth. Well was completed natural with a 21-hour rock pressure of 440 psi.

CALIFORNIA

New Gas Finds Added In Sacramento Valley

Western Gulf Oil Co. completed a wildcat in southeastern Colusa County as a better than average gas producer. On a production test before the well was shut-in pending a pipeline outlet, it flowed at a 7,600 M.c.f. rate through a ¼-in. bean. Initial flow pressure was 1,200 psi. and shut-in pressure recorded was about 2,900 psi.

The new field discovery, Western Gulf 1 Arbuckle Unit-C, is in SE SE 3-13n-2w, or about 2 miles from the town of Arbuckle. Production is from perforations at 5,873-5,910 ft. and 5,580-5,608 ft.

● In the Beehive Bend area of Glenn County, some 35 miles north, E. L. Doheny apparently has expanded gas production northward. Its 2 Doheny-G.P. Unit 1, ½-mile north of the discovery, was being completed in perforated intervals between 5,270-5,640 ft.

General Petroleum Corp. was preparing to drill another outpost in SE 28-20n-2w. This test, 2 Section 48 Unit, is ½ mile northwest of the new Doheny well.

Deep Test for Oxnard Area

General Petroleum Corp. staked location for a deep test midway between the Oxnard field, Ventura County, and a 10,000-ft. dry hole drilled 4 miles to the southwest. The wildcat, 1 McKee, will be drilled in NW NE 16-1n-22w. Last month Standard Oil Co. of California extended Oxnard oil production into NW NE Section 2.

West Montalvo Test Watched

About 2 miles north of the town of Oxnard, in NW SE 21-2n-22w, Standard Oil Co. of California set pipe in a deep test which has been closely followed. With hole bottomed at 15,022 ft., 7-in. casing was set at an undisclosed depth in 3-1 Borchard. The operator was below 8,800 ft. in three other outposts to West Montalvo production.

CANADA

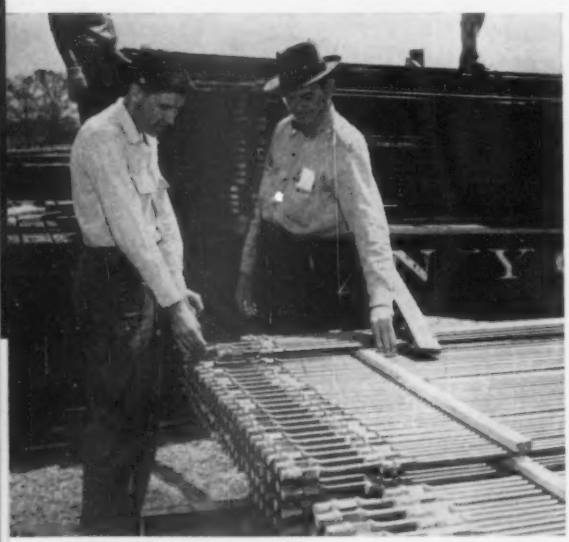
Nine Wells Indicate New Discoveries

Another nine wells in western Canada indicated new pool discovery during the past 7 days. Seven of those tests lie within Alberta's boundaries, two lie in southeastern Saskatchewan, and the other is in the northeastern sector of British Columbia. Four of Alberta's strikes were oil discoveries while the other three chalked up indications of gas success. Both of Saskatchewan's discoveries gave up oil recoveries on drill-stem tests and the British Columbia exploratory venture was also a crude oil strike.

The major land holders in the Whitecourt area of northwestern Alberta, namely, Canadian Fina Oil, Ltd., Stanolind Oil & Gas Co. and Hudson's Bay Oil & Gas Co., Ltd., acting as a development team on 1,100,000 acres of reservation rights held in that area, were rewarded with gas success at another two wildcat drillsites. The other gas strike in Alberta, meanwhile was re-

AXELSON PICTORIAL

OPEN HOUSE. At the opening of new district offices for Continental Oil Company at Eunice, New Mexico, this was the reception committee: (left to right) Ruth Carter, Bob Gault, Janelle Johnson, Patsy Marshall, Joe Habelman, Donnie Niales, Hal Cox, and George Cummings. Conoco now has two district offices in New Mexico; the other is at Hobbs.



35,000 FEET. Unloading a carload of Axelson Sucker Rods at the J&L store in Shreveport, Louisiana, are C. F. Haman (right), Store Manager, and W. L. Holloway, Pelican Trucking Company. The shipment weighed 23 tons and consisted of 35,000 feet of #59 and #60 pin and pin rods in ⅞" and ¾" sizes, about a two-month supply.

FREELOADER. This was the coffee and sandwich bar at Continental Oil Company's Open House in the new district offices at Eunice, New Mexico. Conoco's charming secretaries serve the boss, W. E. Allen, Superintendent of the newly opened Eunice district. Hostesses are Patsy Marshall, Donnie Niales, Janelle Johnson, Ruth Carter.

WHAT'LL YOU HAVE? Buying pump parts for Alice Johnson #4 in the Muenster Field, Cook County, Texas, is F. E. Heath (right), District Foreman for General American Oil Company of Texas. An Axelson Plunger Pump was installed in this well in 1944 and is still pumping. Because of a severe corrosive condition, it is pulled every three months, reworked and rerun into the well. D. C. Jones, J&L Manager of the Muenster store, writes up the order.

BOOM. This well (Mrs. Jessie Brown et al No. 1) was the discovery well for the Kelley-Snyder Field in Scurry County, West Texas, for Standard Oil Company of Texas. Completed November 1948, it was responsible for the great Snyder boom of 1949-50. It is now a water-injection well for the SACROC unit, the largest utilized operation in the world. Many Axelson 2" (1½") Sure-Seal and 2" (1¼") RL Pumps are at work in this field. (Left to right) Bob Hand, District Engineer; Norman Phillips, Production Foreman; George Ator, Production Clerk, all of Standard of Texas, and Forrest Goin, Axelson Representative.

SINCE '24. Looking over the Mitchell #1 in the Wellington Field at Fort Collins, Colorado, are Emmet Richman (right), Production Foreman, Fort Collins Producing Company, and Tom Mayo, Axelson District Manager. The 4,200 ft. well makes 220 B/D (10 bbls. net of 35 gravity oil) with an Axelson 2½ x 2 x 12 RWT Sure-Seal – the ideal pump for water flooded wells. Richman has been using Axelson equipment since 1924.

No. 9

AXELSON

AXELSON MANUFACTURING COMPANY

Division of U. S. Industries, Inc.

6160 South Boyle Avenue, Los Angeles 58, California

Specify **AXELSON** *for*
Subsurface Pumps
Sucker Rods
Stuffing Boxes
& Packing
for better production

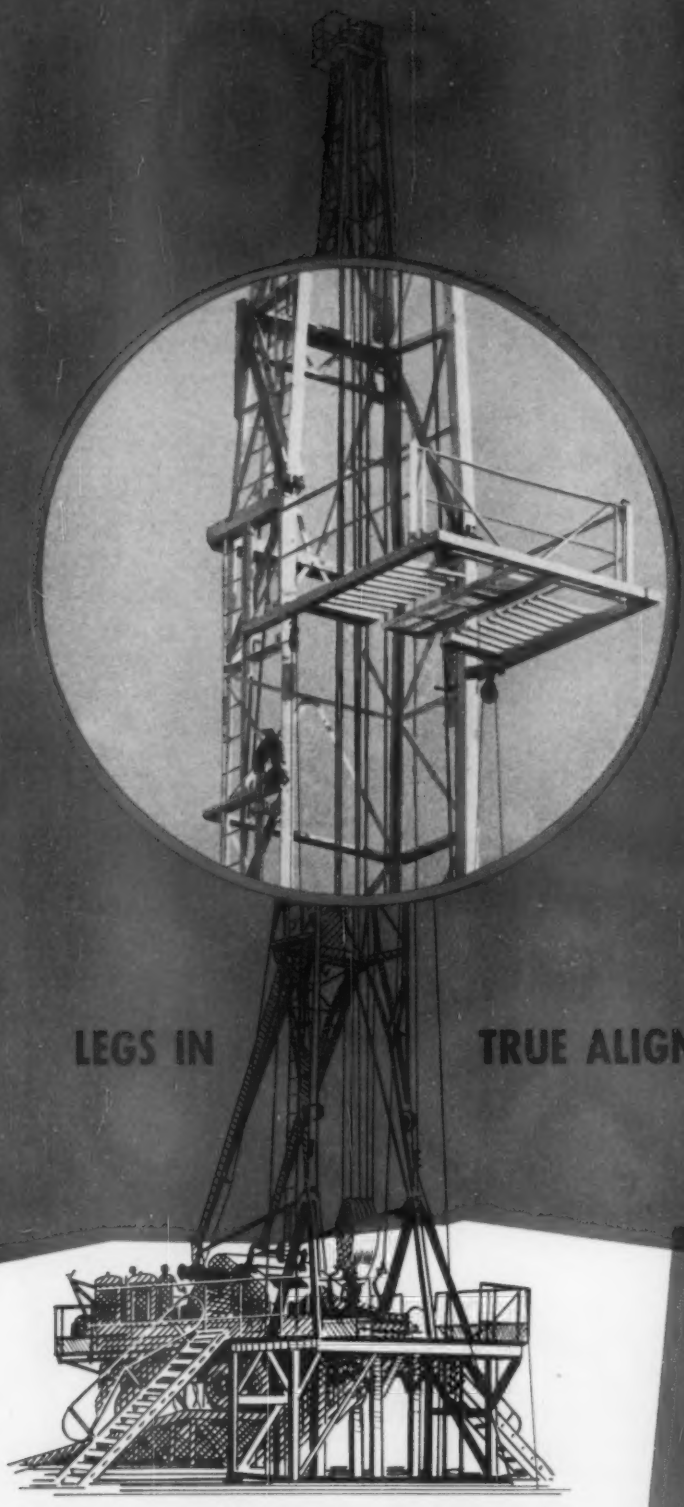
Where to buy Axelson Production Equipment:

CALIFORNIA: *Axelson stores at Bakersfield, Coalinga, Huntington Beach, Long Beach, Orcutt, Santa Fe Springs, Taft, Ventura; Hickey Pipe & Supply Co. (Sucker Rods)* • **MID-CONTINENT:** *Jones & Laughlin Steel Corporation, Supply Division (Headquarters, Tulsa)* **ROCKY MOUNTAINS:** *Jones & Laughlin Steel Corporation, Supply Division; Great Northern Tool & Supply Co., Billings, Montana* • **CANADA:** *Jones & Laughlin Steel Sales Co. Ltd., Calgary; Dominion Oilfield Supply Co. Ltd., Calgary* • **MEXICO, D. F.:** *Wells Fargo & Co. Express, S. A.* • **RIO DE JANEIRO, BRAZIL:** *MAQUIP (Commercial de Maquinas e Equipamentos) S. A.* • **LIMA, PERU:** *Gross Equipment, S. A.* • **LA PAZ, BOLIVIA:** *Del Prado & Compania, Ltd.* • **BUENOS AIRES, ARGENTINA:** *Adrian Bolland & Cia., S. R. L.* • **BARCELONA, VENEZUELA:** *Servicios Industriales, C. A.* • **MARACAIBO, VENEZUELA:** *Servicios Industriales, C. A.* • **BOGOTA, COLOMBIA:** *Servicios Industriales, C. A.* • **TRINIDAD, B. W. I.:** *Industrial Agencies, Ltd.*

LEE C. MOORE

TRAILER MOUNTED MASTS

The top section of Lee C. Moore trailer mounted masts is retractable for greater mobility. Mast legs are in true alignment during drilling operations to assure maximum strength and rigidity.



LEGS IN TRUE ALIGNMENT NO OVERLAP . . .

SINGLE TRAILER MOUNTED MASTS
86 ft 94 ft. 97 ft. 97 ft. Heavy duty
100 ft. 126 ft. Export Model

DUAL TRAILER MOUNTED MAST
97 ft. 100 ft. 126 ft. 126 ft. Export Model

LEE C.
Moore
CORPORATION

TULSA : SHREVEPORT : GREAT BEND : CASPER : NEW ORLEANS
CENTRALIA : DALLAS : HOUSTON : MIDLAND : PITTSBURGH

EXPORT OFFICE:—ROOM 624, INTERNATIONAL BLDG., 630 5TH AVE., NEW YORK 20, NEW YORK

FOREIGN LICENSED MFR. OIL WELL ENGINEERING CO., LTD., CHEADLE HEATH, STOCKPORT, ENGLAND

corded at a British American Oil Co., Ltd., operated venture in the Sibbald area on acreage farmed out to it by the team of Sun Oil Co., Canada Southern Petroleums. Ltd., and Royalite Oil, Ltd.

● The Sturgeon Lake areas of Alberta, where one of this province's largest proven deposits of oil in the D3 reef is located, came up with a pair of surprises during the period under review as oil was discovered in the D2 formation at an Amerada Petroleum Corp. driller and in the Winterburn dolomite (another sector of the Devonian) by Hudson's Bay Oil & Gas Co., Ltd. test. Another of the oil discoveries was at a well drilled some time ago by Western Leaseholds, Ltd., just north of Calgary city limits, that well was completed primarily as a D1 zone gas test but the operator decided to go back into it and run evaluation tests in the Cardium sand, from which some formation oil has been recovered. The other crude oil strike was, according to unofficial reports on the well, made by Home Oil Co. and associates at its current wildcat test in the Virginia Hills area, 115 miles northwest of Edmonton.

Imperial Oil, Ltd., was responsible for both of the Saskatchewan strikes when two wells, 1¾ miles apart indicated oil success in the Mission Canyon sector of the Mississippian. That firm also had a hand in the British Columbia discovery, as a well it is drilling with Pacific Petroleums, Ltd., indicated oil success in the Triassic zone.

One of the Fina-H.B.-Stanolind tests, 1 Pine Creek, on LSD 2, 10-58-10w5, flowed gas at a maximum rate of just over 10,000 M.c.f. daily during the initial test in the D3 while the second test in the zone gave up a gas flow rate estimated at 3,000 M.c.f. The other well in this area drilled by the same team but 25 miles northwest, 15-25 Silver Creek, on LSD 15, 25-60-16w5, drill-stem tested 42 ft. of the same formation as the other well and recovered gas at maximum rate, 10,000 M.c.f. per day along with the gas on the Silver Creek venture, however, were good recoveries of condensate.

● British American's new strike in the Sibbald area, B.A. et al 10-12 Sibbald, LSD 10, 12-30-1w4, lies near the Saskatchewan-Alberta border, 175 miles east-northeast of Calgary. It indicated discovery in the Banff zone of the Mississippian formation when a gas flow rate of 6,250 M.c.f. per day was drill-stem tested from that horizon.

● On the oil side of the ledger Amerada's new discovery in the Sturgeon Lake area coupled with the Hudson's Bay strike in the same area, raised the number of prospective oil zones in that field to five, which include beside the two new sectors, the Triassic, Rundle, and D3 formations. There is also a prolific gas horizon in this same area, namely the D1 zone. The Amerada operated venture, Amerada-H.B. Crown "R" 1-20 Union, on LSD 1, 20-69-22w5, was responsible for the D2 discovery, when 410 ft. of oil was recovered from a drill-stem test in that zone. Along with the oil was a column of salt water which may or may not effect the commercial prospects of production from this zone. This test has since been carried down to the D3 formation and the operator is completing it as an oil well from that lower sector of the Devonian. Hudson Bay's venture, H.B.-Union 3-5 Liberal, on LSD 3, 5-69-21w5, 6½ miles southeast of the Amerada strike, has had two tests run in the Winterburn which have both given good recoveries of oil with the best recovery being made on the initial test in the zone when 1,050 ft. of that product was taken from the drill-stem.

● The oil discovery just north of Calgary, Western 8-34 Beddington, on LSD 8, 34-25-1w5, was previously proved productive of gas in the D1 when a flow rate of 1,250,000 cu. ft. daily was measured on production test. This sector was then closed off and a 10-ft. interval in the Cardium was perforated and swabbed. Initial returns on swab test from that interval indicated

R&M "All-Weather-40" Oil Country MOTORS

Steel parts are moisture-protected by R&M's exclusive rust-resistant undercoating . . . cast iron parts are anti-corrosion primed. Windings are varnish-dipped and baked, *then dipped and baked again*, for added protection. Terminal box is gasketed and power leads are sealed at the motor shell. Splash baffles lock out wind driven rain and factory-installed rodent screens prevent the entry of small animals and debris. Yet, you still get a 40° heat rise motor with guaranteed service factor. You get all these R&M "All-Weather" features at no extra cost.

Get complete information now by writing for Bulletin 3019-DGJ or call your R&M representative.

ROBBINS & MYERS, INC.

Motor Division • Springfield, Ohio

the presence of formation oil. The commercial prospects of the well from this strata, however, will depend largely on a sand fracture which is being made on the sand at the present time.

● Home's venture, meanwhile, Home-Union-H.B. 9-20 Virginia Hills, on LSD 9, 20-65-13w5, according to the unofficial reports, discovered its oil in the Waterways, or Lower Devonian, when an unspecified amount of that fluid was recovered during a drill-stem test. As well as the oil on that test, which was reported to have graded at 40°, was a gas flow estimated at 3,000,000 cu. ft. daily.

Imperial's two southeast Saskatchewan discoveries lie in the Glen Ewen area, 35 miles northwest of Estevan townsite. One of those, Imperial 13-7 Glen Ewen, LSD 13, 7-3-1w2, ran a series of four drill-stem tests in the Mission Canyon to indicate its success and recovered up to 300 ft. of oil from those operations during one of the evaluations; while the other well, 1¾ miles north of the 13-7 venture, Imperial 11-19 Glen Ewen, on LSD 11, 19-3-1w2, indicated its success when two tests gave up to 600 ft. of clean oil from the same zone. Both of those wells are being tested for production at the present time.

Switching now to British Columbia, Imperial-Pacific 1 Boundary Lake exploratory test, on LSD 11, 10-85-14w6, 30 miles northeast of Fort St. John town and 5 miles southwest of production in the Boundary Lake oil field, gave up 810 ft. of gassy sweet oil from a drill-stem test conducted in the Triassic zone, which is the producing zone at the field. Further tests are being conducted on the hole at the present time.

QUICK
to install!

EASY
to counterbalance!

LOW-COST
trouble-free service

. . . that's a JENSEN!

A JENSEN JACK has many outstanding features that meet the producer's requirements for economy and efficiency. Quick installation. Easy one-man counterbalancing. All-around low cost.

Changing gear ratios, from double to single and from single to double, is a quick one-man operation. Yes, sir, from beam to base, a JENSEN JACK has engineering features that afford dependable service and low-cost operation. Just ask anyone who has a JENSEN JACK over his well . . . or see your JENSEN Dealer. Write us, if you wish.

JENSEN JACKS

JENSEN BROS. MFG. CO., INC.
Coffeyville, Kansas, U.S.A.
Export Office:
60 East 42nd Street, New York, N. Y.

KANSAS

SOUTHWEST KANSAS

State Test Awaited At Haskell Discovery

State tests are due at an inside Hugoton field Morrow sand gas and oil discovery in southwestern Haskell County. The important deep strike is Trees Oil Co. and Associates 1 Moore, C NW NW 21-30s-34w, 3 miles west of Satanta.

The Moore discovery swabbed and flowed 1,000 M.c.f. of gas per day and 15 bbl. of oil per hour from the Morrow-Pennsylvania sand topped at 5,350 ft. Perforations are at 5,370-80 ft.

Morrow Discovery Finaled In Meade County

Meade County has a new Morrow gas field. C.R.A. and Wakefield 2 Baty was completed flowed 7,900 M.c.f. of gas per day from the Morrow sand at 5,611-26, 5,630-36 and 5,640-44 ft. Location is 1 mile west of the town of Plains, and 2 miles northwest of Stevens field in SW SW SW 17-32-30.

SOUTHERN KANSAS

Gas Flow Gaged at Barber County Discovery

Honaker-Davis is waiting for state tests at its 1 Bevans, a gas discovery well in SE SE SE 6-34s-11w, 1½ miles southwest of Rhodes pool in Barber County. The well gaged 10,000 M.c.f. of gas daily on 1-in. choke. Production is from Mississippian.

Flowing Oil Strike In Harper County

Harper County has a flowing oil discovery between Spivey-Grabs and Sharon pools in the northwestern part of the county. The strike is Pickrell Drilling Co. 1 Davis "Twin," SE SE SE 5-32s-9w. A drill-stem test at 4,302-30 ft. gaged 428 M.c.f. of gas and re-

covery was 150 ft. of gas-cut mud and 30 ft. gas-cut and slightly oil-cut mud. Another test at 4,330-50 ft. gaged 75 M.c.f. of gas and oil flow was after 100 minutes. The last test, 4,350-70 ft., recovered 145 ft. of gassy oil and 5 ft. of muddy water.

NORTHWEST KANSAS

Possible Cambrian Strike Seen at Dual Norton Well

Cities Service Oil Co. has a possible Cambrian-Reagan sand and Lansing-Pennsylvanian discovery in Norton County's southeastern sector. The 1 Archer, SE SW SW 12-5s-22w, recovered 215 ft. of free oil, 27 ft. muddy oil and 3 ft. of salt water on a drill-stem test in the Lansing at 3,297-3,323 ft. The Reagan sand test at 3,542-45 ft. recovered 195 ft. of oil and 20 ft. muddy water.

LOUISIANA

SOUTH LOUISIANA

St. Charles Parish Wildcat Opens Gas-Condensate Pay

Lone Star Producing Co. has a gas-condensate discovery in the Hahnville area, northwestern St. Charles Parish.

Its 1 Zimmer, discovery well, tested 2,600,000 cu. ft. of gas per day while on ¾-in. choke. Flow was under pressure of 3,450 psi. Gas carried a spray of condensate.

Production is from perforated interval of 10,660-68 ft. in Miocene sand. Hole was drilled to 11,250 ft.

Location is 2½ miles southeast of nearest production at Hahnville. It is less than 20 miles west of New Orleans.

Long Stepout Produces In Bosco Area Discovery

A 1½-mile westward stepout from the Acadia Parish side of Bosco field is proving productive of gas and condensate in a Frio sand, perforated at 9,542-52 ft.

Humble Oil & Refining Co. drilled the well, its 1 Mire et al, to 13,500 ft., and cased the hole to 12,500 ft. Promising showings were encountered in several sands below the present producing zone but tests failed to get commercial production.

Bosco field, on the Acadia-St. Landry parish line, was discovered in 1934. It is productive from multiple sands ranging in depth from 7,800 to 8,700 ft.

Humble's discovery also is only about 2½ miles east of the south end of the Branch gas field, discovered in 1942, with production from multiple Frio sands from 9,875 to 12,000 ft.

Extension Well Uncovers Another Venice Pay Zone

Venice, in Plaquemines Parish's delta marshes, is getting another oil-productive reservoir to add to the more than 35 different pay zones and segments already uncovered on and around the dome.

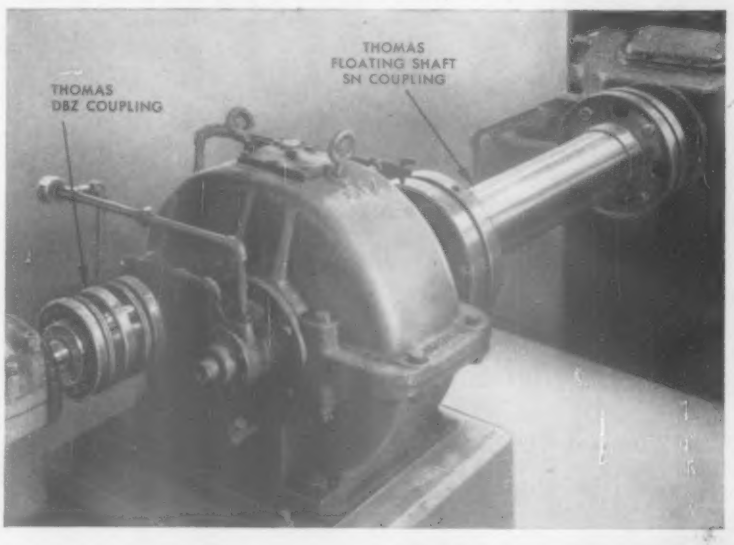
Latest discovery is by Robert W. O'Meara, of New Orleans, whose 1 Cattle Farms, in 2-22s-30e. flowed at the rate of 174 bbl. of 24°-gravity oil per day while testing through ⅛-in. choke.

Its new Miocene pay is perforated at 9,414-27 ft. with bottom of the hole at 10,015 ft. Flowing pressure was 1,200 psi., and gas-oil ratio 550 cu. ft. per barrel.

O'Meara's well is about a half mile south of nearest other production at Venice. The field, discovered in 1937, has production from sands ranging in depth from 250 ft. (Pleistocene) to below 15,000 ft. (still in Miocene).

THOMAS FLEXIBLE COUPLINGS

Give You Freedom From Coupling Maintenance



NO LUBRICATION · NO MAINTENANCE · NO WEARING PARTS

Future maintenance costs and shutdowns are eliminated when you install Thomas Flexible Couplings. These all-metal couplings are open for inspection while running.

They will protect your equipment and extend the life of your machines.

Properly installed and operated within rated conditions, Thomas Couplings should last a lifetime.

Under Load and Misalignment only Thomas Flexible Couplings offer all these advantages:

1 Freedom from Backlash Torsional Rigidity
2 Free End Float
3 Smooth Continuous Drive with Constant Rotational Velocity
4 Visual Inspection While in Operation
5 Original Balance for Life
6 No Lubrication
7 No Wearing Parts
8 No Maintenance

Write for Engineering Catalog 51A

THOMAS FLEXIBLE COUPLING COMPANY
WARREN, PENNSYLVANIA, U.S.A.

LOUISIANA OFFSHORE

Vermilion Area Discovery Boosts Far-Offshore Fields

Shell Oil Co.'s new oil-field discovery 45 miles off Vermilion Parish's shoreline in the Gulf of Mexico marks another major stepout in exploration along the outer fringes of Louisiana's Continental Shelf.

It is the sixth field found within the 45 to 50-mile range from land, and the farthest offshore in the Vermilion area. Nearest production is California Co.'s recently completed gas-condensate discovery well in Block 160, East Cameron area, 16 miles west.

Shell's well, a joint operation with Humble Oil & Refining Co., on OCS Lease 1443, in Block 164, Vermilion area, produced at the rate of 220 bbl. of 43.2°-gravity oil and 99,000 cu. ft. of gas per day while testing through 9/64-in. choke. Flow was with pressure of 1,150 psi. Pay interval, in Miocene sand, is 6,758-72 ft. Hole had been drilled to 8,493 ft.

Offshore Drilling Co., contractor on the discovery well, also is making hole on the second hole, which will be bottomed about 1,000 ft. northeast. Location is in 97 ft. of water.

1957 February 1957
TOP PERFORMER
Break in the New Year with a Better Block —
McKISSICK
SPEED NUT
SNATCH BLOCK
Is quick and safe
Eliminates all lower bolts facilitating easy opening and closing.
Two quick turns of "speed nut" and block is ready to open or close.
"Speed nut" is never completely removed and cannot be lost.
McKissick Builds A Better Block For Every Purpose.
Catalog on Request
McKISSICK
McKISSICK PRODUCTS CORPORATION
Box 2496 Tulsa, Oklahoma

MICHIGAN

Deepened another 10 ft. in Dundee, additional oil and gas pay zone was drilled at Granville C. Berlin 1 Asakevich, SW SW SW 1-16n-2e, Mills Township wildcat, Midland County. Dundee top was first logged at 3,366 ft. Initial oil pay was drilled between 3,460-62 ft. where well showed for about 1,100 ft. of free oil natural on an overnight fill-up test. After long string of 5-in. casing was run at 3,389 ft. and hole was cleaned out well did not carry as much oil and gas as first showed.

However, after deepening to about 3,472 ft., present total depth, hole started to show more gas than was originally logged and well filled 1,500 ft. with free oil in about 16 hours. Next day well swabbed about 17 bbl. of oil and more than 17 bbl., but not definitely measured, the third day after drill-in. Well was scheduled to be acidized.

This new wildcat, located about 1½ miles southeast of Bentley Dundee lime oil pool, appears to have all the earmarks of another new pool opener for Michigan, one that should measure up to or surpass the better producers drilled in the older Bentley pool.

● Reynolds pool, Montcalm County, appeared to have been bulged further to the east with the very successful completion on this side of the pool at McClure, Swan-King, Basin & Ackermann 2 Stauffen, NE NW NE 7-12n-9w, Winfield Township. Well, bottomed out in pay at 3,336 ft., filled and flowed 120 bbl. of oil natural first 14 hours through a restricted choke.

NEW MEXICO

SOUTHEAST NEW MEXICO

New Pennsylvanian Fields Have Extension Prospects

One of Lea County's most active new areas, 15 miles southwest of the town of Lovington, had prospects of discoveries or extension wells.

Skelly Oil Co. 1 Sombrero Unit, 12-16s-33e, 2 miles north of Sinclair Oil and Gas Co.'s Seaman-Pennsylvanian discovery, flowed oil on a drill-stem test at 13,167-84 ft. The section covered apparently was in the Pennsylvanian.

No. 1 Sombrero Unit hit a drilling break at 13,167-73 ft., and at total depth of 13,184 ft., registered a heavy gas kick. On the drill-stem test, oil surfaced in 45 minutes, and tanked 87 bbl. of 50° oil in 6 hours and 25 minutes. Gas volume was at the rate of 2,000 M.c.f. per day. Flowing pres-

unquestionably...the most advanced and modern rig in the world today

SUPER GIANT RIG...

RATED DEPTH CAPACITY

9,000 Ft., Using 4½" Drill Pipe
11,000 Ft., Using 3½" Drill Pipe

RATED POWER CAPACITY

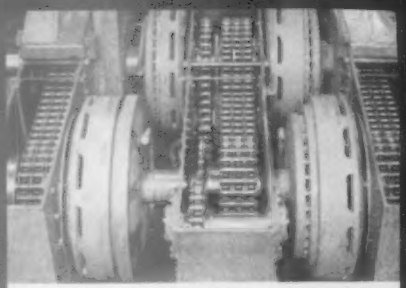
Direct Drive—900 HP
With Fluid Couplings—1100 HP
With Torque Converters—1350 Hp

YOU OWE IT TO YOURSELF TO INVESTIGATE THIS NEW AND MODERN RIG BEFORE BUYING

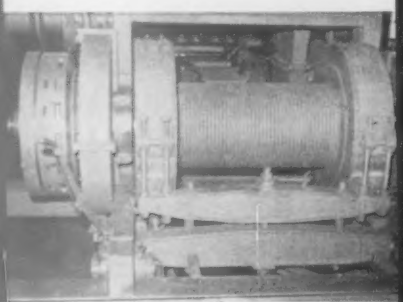
Write for Full Details

WILSON MANUFACTURING CO., INC.

WICHITA FALLS, TEXAS • the home of RED IRON



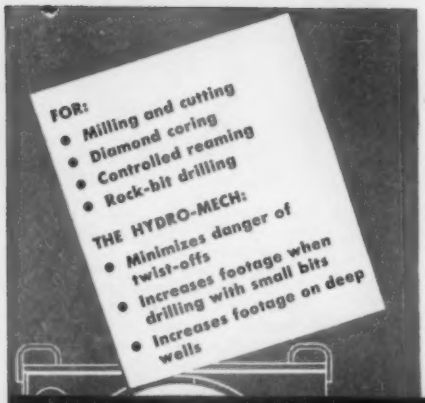
- *With New Three Speed and Reverse All Friction Clutch Transmission*
- **Available with Parkersburg 22" Single Hydromatic Brake Mounted on Transmission *with 6 Speeds Between Drum and Brake*—The Best Hydromatic Brake Arrangement Yet Devised!**



- **With New Beam Equalizer, Single Nut Adjustment Lever Type Brake which CANNOT KICK.**
- **Oil Bath Drum Drive Chains Outside Frame**
- **High and Low Clutches on End of Drum Shaft**
- **Heavy Plate Chain Cases and Covers**

be modern-

buy Wilson

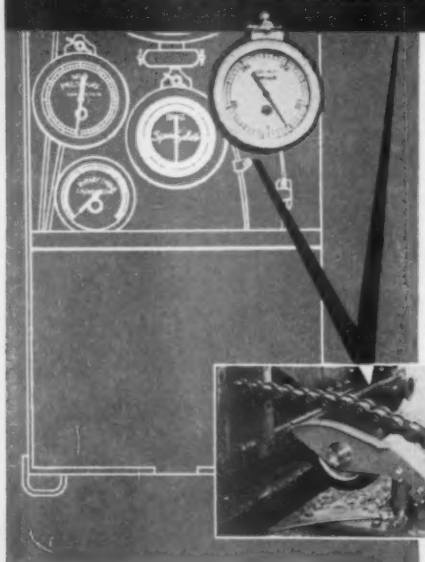


Easily installed on any chain-driven rotary.

Responds to the slightest torque changes.

Adjustable for net-torque-on-bottom.

WHY MANY OPERATORS DEMAND HYDRO-MECHS ON ALL THEIR RIGS



Easy to move from well to well.

Stabilizes chain and gives it longer life.

Models for single or double-link chains.

The Hydro-Mech idler assembly rides under the rotary chain and transmits hydraulic impulses to a gauge in the drilling-control panel or in any other convenient spot.

Torque is one of the most important variables in any drilling operation — with too little, you're wasting men and equipment; with too much, you're courting an expensive twist-off. Recognizing these pitfalls, more and more contractors and operators are demanding that their rigs be equipped with Hydro-Mech torque gauges. Compared to a $10,000 fishing job, the cost of a Hydro-Mech is certainly negligible.

Distributed through Reed, National, and other recognized supply houses.

MARTIN-DECKER CORP.

HOME OF THE WEIGHT INDICATOR — LONG BEACH, CALIFORNIA

HC® units by Young

FOR COOLING . . . WATER . . . OIL . . . GASES

FOR CONDENSING . . . STEAM . . . VAPORS

HC units by Young are used the world over in oil field applications where dependability of cooling performance is essential . . . this is *where quality counts!* These horizontal core units combine the *efficiency* of vertical air discharge, the *economy* of compact Young design, the *versatility* of multiple unit installations. Built for rugged service, HC units are the result of many years of heat transfer specialization by Young. They are available in a wide range of capacities and services . . . single installations, such as the one pictured above, or in multiple installations of seven basic sizes. Why not call on *specialists* to solve *your* heat transfer problems? Call Young!

Write Dept. 207-B.
for FREE Catalog.

Young RADIATOR COMPANY

RACINE, WISCONSIN

Creative HEAT TRANSFER ENGINEERS FOR INDUSTRY

Heat Transfer Products for Automotive, Aviation and Industrial Applications. Heating, Cooling, Air Conditioning Products for Home and Industry.

Executive Office: Racine, Wisconsin, Plants at Racine, Wisconsin, Mattoon, Illinois

Map shows location of Skelly Oil Co. 1 Sombrero, 2 miles north of Seaman field, and Ohio Oil Co.'s 1 SA State, 1 mile northeast of Kemnitz field. Skelly's well flowed oil in the Pennsylvanian, and Ohio's test made a flow in the Wolfcamp.

sure was 1,535 psi.; shut-in pressure was 6,810 psi.

On elevation of 4,183 ft., formation tops in 1 Sobrero were: Pennsylvanian 10,470 ft., Canyon lime 11,080 ft., Canyon sand 11,180 ft., and Atoka at 12,480 ft. Sinclair's Seaman Unit discovery completed in the Pennsylvanian around 12,750 ft.

Kemnitz area stepout . . . Ohio Oil Co. 1 State "SA," a mile northeast of Tennessee Gas Transmission Co.'s 1-A Kemnitz, a Permo-Pennsylvanian discovery, reported a flow of oil from the Wolfcamp.

Sample top on the Wolfcamp was 10,600 ft. on elevation of 4,141 ft. A drill-stem test at 10,570-10,613 ft., open 2 hour sand 50 minutes, had gas in 10 minutes, and oil and mud in 45 minutes. It flowed into pits for 5 minutes, then gaged 102 bbl. of 37.5° oil in 2 hours. Flowing pressure ranged from 1,160-1,980 psi., and increased to 3,500 psi. when shut in. Gas-oil ratio on the above gage was 1,330:1. Drilling continued below 10,717 ft.

Tennessee Gas 1-A Kemnitz completed for 412 bbl. of oil a day from pay at 10,742 ft.

OKLAHOMA

NORTHERN OKLAHOMA

New Cherokee Trend Pay

The Cherokee - Pennsylvanian trend in northern Grant and Alfalfa counties added a new producing zone at two separate wells, although the wells were completed in the regular area pay, basal Pennsylvanian. Vierson & Cochran 2 Bennett, C NE NE 18-28n-8w, Grant County, tested gas in the new lime pay (Oread in age) at 3,580-3,660 ft. The well was completed in regular field pay at 4,918-28 ft. flowing 134 bbl. of oil per day on 12/64-in. choke.

The 2 Giesel, C SW SE 13-28n-9w, Alfalfa County well, found the new possible pay at 3,684-3,710 ft. A drill-stem at 3,662-3,720 ft. flowed gas. This well was also completed in the regular pay at 5,010-28 ft. flowing 192 bbl. of new oil in 8 hours on 20/64-in. choke.

West Red Rock Field Adds Big Gasser

A big gas well was completed in Noble County's West Red Rock area. An-Son Petroleum 1 Plumley, SE NW SE 21-23n-1e, flowed on open flow calculation 48,336 M.c.f. per day. Perforations are at 4,240-68 ft.

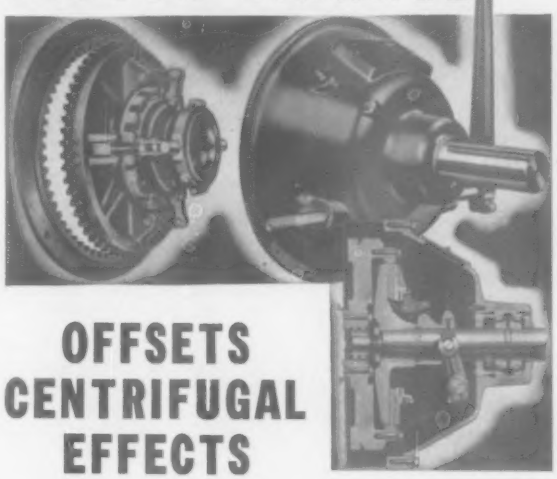
NORTHWEST OKLAHOMA

Morrow Oil Flows at Laverne District Offset

An offset well in Harper County's Laverne district flowed oil from the Morrow - Pennsylvanian sand. Sunray-Mid-Continent Oil Co. 1 Holmes, NW NW SE 22-26n-25w, flowed an average 11.66 bbl. of oil per hour on tests. Perforations were at 6,978-7,006 ft.

ROCKFORD

BALANCED CLUTCH LINKAGE



OFFSETS CENTRIFUGAL EFFECTS

Disengagement of the clutch in ROCKFORD Power Take-Offs is positive. It is accomplished by a linkage arrangement which is counterbalanced to offset the effects of centrifugal force—*prevalant in high-speed modern engines.* This is just one of several competitive advantages ROCKFORD Power Take-Off equipped engines provide.

Send for This Handy Bulletin

Shows typical installations of ROCKFORD CLUTCHES and POWER TAKE-OFFS. Contains diagrams of unique applications. Furnishes capacity tables, dimensions and complete specifications.

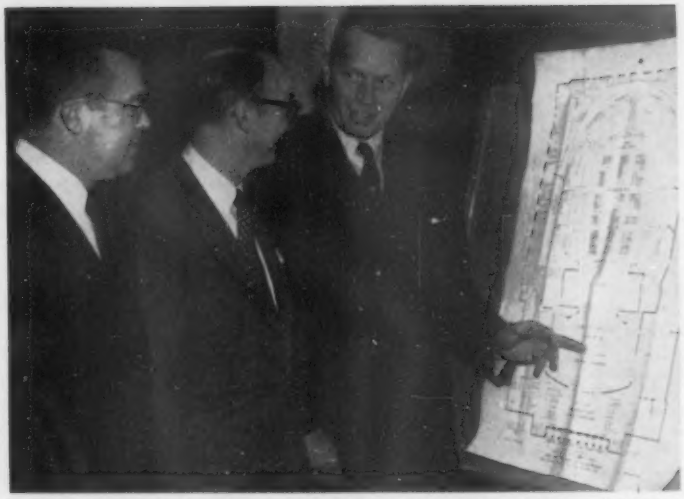
ROCKFORD Clutch Division BORG-WARNER

1305 Eighteenth Ave, Rockford, Ill., U.S.A.

Export Sales Borg-Warner International — 36 So. Wabash, Chicago 3, Ill.

CLUTCHES

A.A.P.G. Meets In St. Louis April 1-4



Dr. Parke A. Dickey, of Carter research, Tulsa, right, explains to Thomas E. Matson, center, Home-Stake Production, Tulsa, and L. Claude Roark, Buffalo Oil, Tulsa, some of the interesting features of Kiel Auditorium where the technical program of A.A.P.G. will be presented. Dr. Dickey is chairman of the technical program. Matson is general vice chairman for finance and Roark is commercial exhibits chairman. More than 2,500 oil finders will attend the meeting where more than 75 scientists will present technical papers on the convention theme, "New Methods and Principles in Petroleum Geology."

WHERE does oil come from? Is "creekology" valuable in oil finding? What are the latest exploration techniques? How old is the earth? Geologists will find the answers to these puzzling questions by attending the annual convention of the American Association of Petroleum Geologists in St. Louis April 1-4. This is a joint meeting with the Society of Economic Paleontologists and Mineralogists.

The theme of the meeting is "New Methods and Principles in Petroleum Geology." Since the war there has been tremendous emphasis on research in all fields of science, including geology. Within the past 10 years nearly all the major oil companies have established geological research groups; in addition they have subsidized research at universities through the A.P.I. and by grants and fellowships. The results are just beginning to be known and their effect on geological thinking is revolutionary. At this meeting results from the research laboratories of nearly every major company will be presented.

Where does oil come from? . . . Shell laboratory has, for 9 years, been studying chemically the source rocks of petroleum. G. T. Philippi will present the results and show that dense shales and limes that produced large amounts

To give you the best service

Certified*

of oil still contain measurable amounts of hydrocarbons. Good source rocks can be distinguished from poor source rocks!

Carter research laboratory, with the support of Creole Petroleum Corp. and other Standard Oil Co. (New Jersey) affiliates, made a study of the migration of oil in the recent sediments at one of the mouths of the Orinoco River in Venezuela. These scientists found measurable enrichment of hydrocarbons in a lenticular sand only 5,000 years old. Basic data on the process of compaction of muds into shales was also obtained.

Is "creekology" valuable? . . . Humble Oil & Refining Co. will present data showing how to find buried structures in regions where the bedrock is masked by alluvium; Humble's geologists use a new and scientific variety of the time-honored creekology method.

The A.P.I. has, for 6 years, sponsored an ambitious study of sedimentation along the north coast of the Gulf of Mexico. The general results of this study will be summarized in a group of six papers by scientists of the Scripps Institution of Oceanography.

For years geologists have examined rock outcrops. They have tried to imagine the environment in which the rocks were deposited and the later changes that occurred to these rocks. For the first time some of these processes have been observed in action. Many features of sediments whose explanation was unknown are now clearly explained. The depth and salinity of the water is revealed by the types of fossils, which have been collected and counted.

New geophysical tools . . . Many new geophysical advances are appearing on the horizon and need to be evaluated by geologists. A review of the more important lines of geophysical research was prepared for the Society of Exploration Geophysicists Research Committee and will be given again at this meeting. The U. S. G. S. has some interesting work to report on the studies of basins using gravity and aeromagnetic data.

A particularly interesting development from Magnolia research laboratory is the Sonoprobe. This device profiles the geologic features in recent sediments on the Continental Shelf.

Four Gulf Research & Development Co. men will discuss the application to oil finding of an important new instrument in well logging—the continuous seismic velocity recorder. This instrument gives promise of providing additional porosity information from bore-hole measurements. And it suggests that seismic maps may evaluate subsurface rocks without recourse to the drill. Paul Lyon, former president of the S.E.G. will discuss the need for integrating geology and geophysics at all levels of operations.

Problems of oil-finders . . . In these days of shortage of technical manpower, the problems of educating petroleum geologists are complex. Prof. Ernst Cloos, the head of the department of geology at Johns Hopkins University, and former president of the G.S.A., will present a straightforward, factual analysis of these problems. Dr. Frank J. Gardner, exploration editor of The Oil and Gas Journal, reviews the significant exploratory achievements of 1956. This is an appraisal of the new thinking in the industry towards deeper rocks, stratigraphic traps, and improved detection and completion methods.

How old is the earth? . . . Another exciting new development in petroleum geology is the determining the age of rocks. Rocks can now be dated by chemical analysis for elements that disintegrate spontaneously. The understanding of the pre-Cambrian in Canada has been altered completely. Dr. J. Tuzo Wilson of the University of Toronto will review these successes and suggest their application to petroleum

...under all conditions

CENTRALIZER PERFORMANCE

The painstakingly engineered design of Larkin Centralizers has provided the oil industry with a product that exceeds every known requirement for centralizer performance . . . performance that has been verified and certified* by an unbiased testing laboratory.

And the field results . . . now proved again in hundreds of applications . . . have shown that Larkin Centralizers will meet any demand: • Convenience of installation • Ease of starting • Maximum centering force • Minimum permanent set • Economy

Larkin offers a complete selection of Casing Centralizers, in Long or Short Lok-On or Slip-On Types with five ranges for maximum efficiency. Specify Larkin "through your supply store." You'll get the best service under all conditions.

LARKIN PACKER COMPANY, INC.
WAXAHACHIE, TEXAS

LARKIN ...Through Your Supply Store

PESA

LARKIN LEADERSHIP HAS BEEN EARNED BY YEARS OF DEPENDABLE PERFORMANCE

geology. Another important trend in petroleum geology thinking is quantitative stratigraphic analysis and facies studies. Drs. Krumbein and Sloss of Northwestern University are leaders in this field and will discuss recent advances. A practical application of their methods will be given by James M. Forgotson, Jr., one of their students who is now employed by the Pan American Petroleum Corp.

PROGRAM

Monday, April 1—2 p.m.

Joint Sessions With S.E.P.M.

Recent Sedimentation in Northern Gulf of Mexico.

Introduction to Symposium on Recent Sediments of Gulf of Mexico, Marcus A. Hanna, Gulf Oil Corp., Houston.

Deltaic Sedimentation Along the Gulf Coast, Francis P. Shepard, Scripps Institution of Oceanography, La Jolla, Calif.

Comparative Studies of Sedimentation in Selected Texas Bays, Gene A. Rusnak and Francis P. Shepard, Scripps Institution of Oceanography, La Jolla, Calif.

Sediments of the Continental Shelf of the Northwest Gulf of Mexico, Joseph R. Curray, Scripps Institution of Oceanography, La Jolla, Calif.

Minor Internal Structures in Recent Gulf Coast Sediments, D. G. Moore and P. C. Scruton, Scripps Institution of Oceanography, La Jolla, Calif.

Macro-Invertebrate Assemblages of the Northern Gulf of Mexico, Robert H. Parker, Scripps Institution of Oceanography, La Jolla, Calif.

Foraminiferal Studies in Northern Gulf of Mexico, Fred B. Phleger, Scripps Institution of Oceanography, La Jolla, Calif.

Tuesday, April 2—9 a.m.

Honors and presidential addresses; guest speaker: Herbert Hoover, Jr., Under Secretary of State.

Tuesday, April 2—2 p.m.

The Role of Clay Minerals in Oil Finding Research Committee Symposium.

Introduction to Symposium, W. D. Keller, University of Missouri, Columbia, Mo.

A Concert of Diagenesis in Argillaceous Sediments, Ralph E. Grim, Department of Geology, University of Illinois, Urbana, Ill.

Geologic Interpretation of Argillaceous Sediments, Charles E. Weaver, Shell Development Co., Houston.

Clay Mineralogy of Pennsylvanian Sediments in Southern Ilinois, Herbert D. Glass, Illinois Geological Survey, Urbana, Ill.

"Glauconite" Pellets: Their Mineral Nature and Application to Stratigraphic Interpretations, J. F. Burst, Shell Development Co., Houston.

Effect of Source and Environment on Clay Minerals, I. H. Milne and J. W. Earley, Gulf Research & Development Co., Pittsburgh 30, Pa.

Tuesday, April 2—8 p.m.

Panel discussion of: The Role of Clay Minerals in Oil Finding, R. A. Rowland and W. D. Keller, moderators.

Wednesday, April 3—9 a.m.

New Geophysical Methods and Principles.

Geology and Geophysics, Paul L. Lyons, Sinclair Oil & Gas Co., Tulsa.

Geophysical Research and Progress in Exploration, Milton B. Dobrin, Triad Oil Co., Ltd., Calgary; and Henry F. Dunlap, Atlantic Refining Co., Dallas.

Gravity Studies of Basin and Range Geology, Don R. Mabey, U. S. Geological Survey, Salt Lake City.

Use of Aeromagnetic Data to Determine Regional Basin Topography, W. J. Dempsey, U.S.G.S., Washington 25, D. C.

The Marine Sonoprobe, a New Type Echo Sounder for Use in Geologic Mapping, C. D. McClure, H. F. Nelson, and W. B. Huckabay, Magnolia Petroleum Co., Dallas.

Continuous Velocity Logging—Its Application to Oil Finding, T. J. O'Donnell, A. R. Gregory, A. J. de Witte, and M. J. R. Wyllie, Gulf Research & Development Co., Pittsburgh 30.

Wednesday, April 3—2 p.m.

Subjects of General Interest.

Offshore Oil Developments, Ira H. Cram, Continental Oil Co., Houston.

Subsurface Quaternary Stratigraphy in Coastal Louisiana and Adjacent Continental Shelf, E. McFarlan, Jr., and M. R. Thompson, Humble Oil & Refining Co., Houston.

Cost of Educating One Geologist, Ernst Cloos, Johns Hopkins University, Baltimore.

Training the Explorationist, J. M. Marsh, Imperial Oil, Ltd., Calgary.

Fracture Analysis Studies, P. H. Blanchet, Blanchet & Associates, Ltd., Calgary.

Time of Deformation in Structural Evaluation, Greenville Dome, Wyoming, James A. Barlow, Jr., Forest Oil Corp., Casper, Wyo.

The Pembina Field, Alberta; Arthur M. Paterson, Merrill Petroleums, Ltd., Calgary.

Significant Exploratory Achievements of 1956, Dr. Frank J. Gardner, The Oil and Gas Journal, Tulsa.

Thursday, April 4—9 a.m.

New Geochemical Methods and Principles.

Recent Developments in Age Dating By Means of Isotopes, J. Tuzo Wilson, University of Toronto, Ontario, Can.

This announcement is neither an offer to sell nor a solicitation of an offer to buy any of these Shares. The offer is made only by the Prospectus.

4,379,758 Shares

Socony Mobil Oil Company, Inc.

Capital Stock

($15 Par Value)

Rights, evidenced by subscription warrants, to subscribe for these shares have been issued by the Company to the holders of its Capital Stock, which rights will expire at 3:30 P.M. Eastern Standard Time on February 19, 1957.

Subscription Price $45½ a Share

The several underwriters may offer shares of Capital Stock at prices not less than the Subscription Price set forth above (less, in the case of sales to dealers, the concession allowed to dealers) and not more than either the last sale or current offering price on the New York Stock Exchange, whichever is greater, plus an amount equal to the applicable New York Stock Exchange commission.

Copies of the Prospectus may be obtained from only such of the undersigned as may legally offer these Shares in compliance with the securities laws of the respective States.

MORGAN STANLEY & CO.

DILLON, READ & CO. INC. — *THE FIRST BOSTON CORPORATION* — *KUHN, LOEB & CO.*

BLYTH & CO., INC. — *EASTMAN DILLON, UNION SECURITIES & CO.*

GLORE, FORGAN & CO. — *GOLDMAN, SACHS & CO.* — *HARRIMAN RIPLEY & CO. Incorporated*

KIDDER, PEABODY & CO. — *LAZARD FRERES & CO.* — *LEHMAN BROTHERS*

MERRILL LYNCH, PIERCE, FENNER & BEANE — *SMITH, BARNEY & CO.*

STONE & WEBSTER SECURITIES CORPORATION — *WHITE, WELD & CO.*

DEAN WITTER & CO. — *DREXEL & CO.* — *HORNBLOWER & WEEKS*

F. S. MOSELEY & CO. — *PAINE, WEBBER, JACKSON & CURTIS*

SALOMON BROS. & HUTZLER — *WERTHEIM & CO.*

January 31, 1957.

Isotopic Age Studies at Key Points in the Geologic Column, L. R. Stieff, T. W. Stern, H. W. Jaffe, and C. M. Cialella, U.S.G.S., Washington 25, D. C.

Uranium and Other Trace Elements in Crude Oils From the Western States, Harold J. Hayden, A. T. Myers, C. A. Horr, U.S.G.S., Bldg. 25, Denver Federal Center, Denver.

Identification of Oil Source Beds By Chemical Means, G. T. Philippi, Shell Development Co., Houston.

Insoluble Organic Matter (Kerogen) in Sedimentary Rocks of Marine Origin, J. P. Forsman, Carter Oil Co., Tulsa.

Migration of Oil in Recent Sediments at Pedernales, Venezuela, A. L. Kidwell, Carter Oil Co., Tulsa.

Ambrosia Lake Uranium Deposit, John A. Masters, Kerr-McGee Oil Industries, Inc., Denver.

Modern Evaporite Deposition in Coastal Peru, Robert Morris, International Petroleum Co., Ltd., Lima, Peru.

Thursday, April 4—2 p.m.

New Mapping Methods and Principles.

Advantages and Limitations of Recent Techniques in Photogeologic Mapping, W. A. Fischer, U.S.G.S., Washington 25, D. C.

Appliaction of Photogrammetry to Isopach Mapping, Structure Contouring, and Other Similar Geologic Problems, William R. Hemphill, U.S.G.S., Washington 25, D. C.

Drainage Patterns—An Aid to Petroleum Exploration in Alluvial Regions, Robert L. Kite, Humble Oil & Refining Co., Houston.

Design and Interpretation in Facies Studies, L. L. Sloss, Northwestern University, Evanston, Ill.

Quantitative Stratigraphic Analysis, W. C. Krumbein, Northwestern University, Evanston, Ill.

Application of Stratigraphic Analysis Methods to the Trinity Group, James M. Forgotson, Jr., Pan American Petroleum Corp., Tulsa.

Write or Wire
for Monthly Stock Lists

● VALVES
● PRESSURE TUBING
● STEEL

Peerless Supply Co., Inc.
L. D. 75 & 76 P. O. Drawer 36-A
Shreveport, La.

EMPIRE
SAND SAMPLE
ENVELOPES
Specially designed and manufactured for storing sand samples. They will last and serve for years. Immediate delivery of any quantity.
PRICES AND SAMPLES ON REQUEST
32# KRAFT
RUSTPROOF
FLEXIBLE
METAL TIE
CORE BOXES
Corrugated boxes for storing Empire Sand Sample Envelopes manufactured to fit your specifications. Inquiries for any size and quantity solicited.
TULSA PAPER CO.
TULSA 1, OKLA.

ROCKY MOUNTAIN

MONTANA

Outlook Area Wildcat Near 9,000-Ft. Objective

Amerada Petroleum Corp.'s Outlook area wildcat in Sheridan County, northeastern Montana, is down below 8,300 ft. toward its 9,000-ft. objective in the Silurian. The 1 Loucks, C NE SW 35-36n-52e, is 4 miles southwest of the 1 Tange Silurian discovery well which was completed recently for 2,742 bbl. of oil per day.

A drill-stem test at the Loucks well in the Bakken-Mississippian at 7,695-7,735 ft. recovered 1,092 ft. of gas-cut mud.

Another well is slated for the Outlook area. The new test will be 1 Ruegsegger, NE NE 24-36n-52e. Location of this 9,500-ft. Silurian try is 2 miles northwest of the discovery well of Outlook field and 3 miles northeast of 1 Loucks.

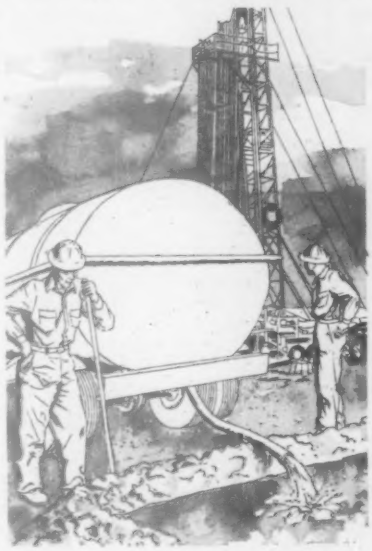
UTAH

North Desert Creek Well Flows 1,400 Bbl. Daily

Shell Oil Co. 22-12 North Desert Creek, C SE NW 12-41s-23e, northwest extension well in San Juan County's booming Paradox play, flowed oil at the daily rate of 1,400 bbl. from perforations in the Paradox at 5,409-98 ft.

The well previously had production in the upper Hermosa zone. Location is ½ mile nothwest of the field's main

Brine in the pit . . .



Like money in the bank

Super-saturated brine will save you hundreds of dollars in workovers, completions, and drilling through salt sections.

Brine is about one-third the cost of drilling muds. Drilling salt sections with brine guarantees a bit size hole, thus saving hundreds of dollars on cement jobs. So when you use Ready-Made brine it's almost like putting money in the bank.

Delivered directly to your location by tank truck, Ready-Made brine saves time and money in handling and, unlike field water, Ready-Made brine is crystal clear and pure. Free of suspended solids, brine will not hydrate or water-block bentonitic producing zones. It makes your completion much easier—much cheaper.

Call the ABI brine company nearest you. You'll get three hour service wherever you are. Also write or call an ABI company for information about brine's industrial uses.

Associated Brine Industries

COMPANY — PRODUCING POINTS
Brine Service Div., Corpus Christi Salt Co — Beaumont, Tex.; Pine Prairie, La.
Brine Service Co. — Houston, Corpus Christi
Toland Brine Service, Inc. — Kermit, Tex.
The Brine Co. — Midland, Tex.; Hobbs, N. M.

producing area. There are now four wells in this prolific Paradox basin field—two by Shell, one by Superior, and one by Phillips.

Production String Set At Desert Creek-Federal

Gulf Oil Corp.'s southwest offset to the 1 Desert Creek-Indian discovery well in C W½ NE 1-41s-22e, San Juan County, has production string down and the operator will perforate. The 2 Desert Creek Federal is at total depth of 5,934 ft.

The discovery well, 1 Desert Creek-Federal, C NE NE 1-41s-22e, flowed 263 bbl. of oil daily on 12/64-in. choke on completion.

NORTH DAKOTA

Amerada Sets Casing at Deep Beaver Lodge Test

Amerada Petroleum Corp.'s deep test in Beaver Lodge field, NW SE NE 2-155n-96w, Williams County, is at total depth of 13,615 ft. with 7-in. casing to 13,610 ft. The 1 Iverson-Nelson Unit topped the pre-Cambrian at 13,591 ft. Cambrian top is 13,535 ft.

This significant deep prospector on the Nesson anticline of North Dakota found oil shows in both the Devonian and Silurian, and some findings in the Winnipeg.

TEXAS

TEXAS PANHANDLE

Lipscomb County Gains Third Producing Area

Humble Oil & Refining Co. has opened the third field in Lipscomb County. The discovery well is 1 R. H. Cowan, 1¼ miles southwest of the town of Lipscomb in the central part of the county.

Production at this new field-opener is from Morrow sand at 10,144-64 ft. The well flowed 11,000 M.c.f. of gas per day plus 6 bbl. of condensate per million. Location is in Section 545, Block 43, H&TC Survey.

Successful Wildcats

COLORADO

Washington County: Petroleum, Inc. 1 Krall "A," C NW SE 15-1s-55w. IPP 132 BOPD, "D" sand discovery, new field. TD 5,000 ft. "J" sand.

NEBRASKA

Banner County: Sun Oil Co. 1 Van Jelt, C SE SE 23-18n-55w. IPP 52 BOPD, "J" sand discovery, new field. TD 6,140 ft.

SOUTHEAST NEW MEXICO

Lea County: J. Don Hudgens, Inc., 1 Shell-State, 8-16s-34e. IPP 15 BOPD, 34°, Queen sand 3,957-77 ft. TD 3,993 ft.

W. R. Weaver 1 Taylor, 11-18s-38e. IP 196 BOPD, ¼-in., TP 300 psi., GOR 580, 35°, Queen sand 4,108-16 ft. TD 6,480 ft.

TEXAS GULF COAST

Harris County: Slick Oil Corp. 1 Peden heirs, John Brock Sur., A-122. (2½ miles north of Rotherwood). IP 17,500 M.c.f. daily, open-flow potential, GOR 168 M.c.f. per barrel, 53.3°, perfs. 5,928-30 ft. (Yegua Y-4 sand). TD 7,071 ft. (Extends new field—2 miles east of East Huffsmith field.)

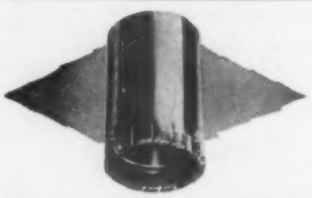
Slick Oil Corp. 2 Peden heirs, John Brock Sur., A-122. (2½ miles north of Rotherwood). IP 15,000 M.c.f. daily, open-flow potential, GOR 158 M.c.f. per barrel, 54°, perfs. 5,954 ft. (Yegua Y-4 sand). TD 7,100 ft. (New field—1½ miles southeast of East Huffsmith field.)

Jefferson County: Sixth M. E. Andrews, Ltd., et al 1 Crow, Seth Davis Sur. 72, A-492. IP 97 BOPD, 3/32-in. 37°, GOR 450 cu ft. per barrel, perfs. 6,093-98 ft. (Miocene). TD 6,319 ft. (New pay in Big Hill field.)

Live Oak County: Exeter Oil Co., Ltd., 1 Pugh, James McGloin Sur., A-25 (12 miles southeast of George West). IP 36 BOPD, 5/32-in., 40°, GOR 12.9 M.c.f. per barrel, perfs. 4,165-57 ft. (Hockley). TD 4,970 ft. (New field.)

Nueces County: Northern Pump Co. 1 Linkenhoger, Blk. 1, Roberts & White Subd., J. A. Eliff Trust Sur. (3½ miles north of Banquete). IP 850 M.c.f. daily, GOR 23.8 M.c.f. per barrel, 52°, perfs. 6,436-45 ft. TD 7,391 ft. (New gas reservoir)

"Mr. Black will see no one without an appointment."



D&S washover shoes save time . . . money!

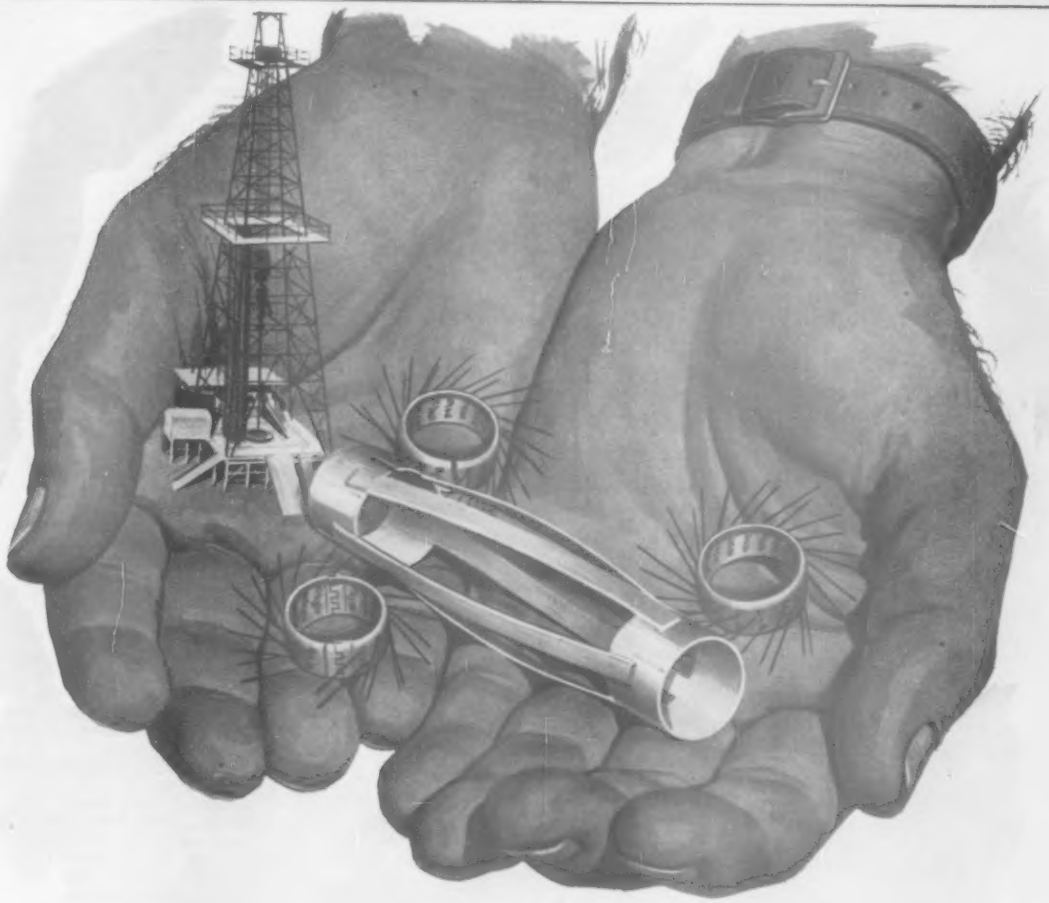
D & S Truco diamond washover shoes perform many extraordinary feats in the oilfield. For example: When a portion of casing collapsed . . it, the tubing, packer, and anchor joint were retrieved inside the washpipe in 3 days rig time using a D & S washover shoe. Proof-positive of savings in time and money with D & S equipment.

WRITE OR CALL TODAY! One of our sales engineers will call on you and explain our custom-services and equipment. Herein lie the real D & S advantages.

Drilling & Service

DIAMOND DRILLING EQUIPMENT
6210 NORTH CENTRAL EXPRESSWAY | DALLAS, TEXAS
OFFICES IN ALL PRINCIPAL OIL AREAS

THE WEATHERFORD TECHNIQUE



Your cement job is in good hands

The Weatherford Technique is your best assurance of a good cement job . . . the most advanced method known for the proper conditioning of the hole, preparatory to and during the running and cementing of casing.

But it is more than that; the Weatherford Technique is the combination of men, equipment, know-how, and service that is being used by operators throughout the world for the successful production of pipeline oil.

The man from Weatherford: (1) surveys the well condition after the electrical log has been run, (2) recommends the proper type, number and spacing of scratchers and centralizers, (3) supplies and installs the equipment on the casing, (4) recommends the proper make-up of the cement slurry and the optimum running time, (5) expertly supervises the entire program, and (6) prepares a complete well report on the casing and cementing operation.

This Technique is indispensable to safe and economical completions. The man from Weatherford gives the job all he's got. You get a better cement job, more profit and less worry.

WEATHERFORD

WEATHERFORD OIL TOOL CO., INC.

GENERAL OFFICES: 5920 Navigation Blvd., Houston, Texas

WEST CENTRAL TEXAS

Fisher County: Shell Oil Co. 1 Callan, 4-3-H&TC, 8 mi. SW Rotan. IP 332 BOPD, ½-in., TP 200 psi., GOR 1242, 39°, Strawn sand 6,238-50 ft. TD 6,996 ft.

Sinclair Oil & Gas Co. 1 Newman, 12-K-T&P, 4 mi. SE Longworth. IP 363 BOPD, 24/64-in., TP 115 psi., GOR 287, 41°, Swastika 3,866-72 ft. TD 3,896 ft.

Nolan County: C. L. Norsworthy, Jr., 2-A Virginia Baker, 122-1A-H&TC, 7 mi. SW Maryneal. IP 273 BOPD, 18/64-in., TP 150 psi., GOR 1270, 43°, Strawn lime 6,944-74 ft. TD 7,210 ft.

Shackelford County: George Hughes, Jr., 1 Newell, Sec. 4, GH&H Sur., 6 mi. W Albany. IPP 17 BOPD, 38°, top Hope sand pay 1,619 ft. TD 1,624 ft.

Stephens County: Warren Petroleum Corp. 3 Wade Boyd, A. C. McDonald Sur., 8 mi. SE Woodson. IP 135 BOPD, 14/64-in., TP 1200 psi., GOR 1940, 40°, conglomerate 4,139-53 ft. New pay in Bowar field.

Throckmorton County: General American Oil Co. of Texas 1 Graham, Sec. 2201, TE&L Sur., 5 mi. NE Woodson. Recompleted as discovery. IP 121.6 BOPD, 17/64-in., TP 280 psi., GOR 1900, 39°, Strawn sand 2,934-40 ft. TD 4,702 ft., PB 2,950 ft.

Shackelford County: William D. Austin 2 Dyer, 86-12-T&P, 14 mi. N Baird. IP 360 BOPD, 16/64-in., TP 200 psi., GOR 400, 40°, Gardner sand 3,383-93 ft., TD 3,486 ft. New field name, Sherry-Ann (Gardner).

Taylor County: Cherry Brothers 1 Newby, J. C. Eccles Sur. 472, 3 mi. SW Ovalo. IP 85 BOPD, 18/64-in., TP 185 psi., GOR 1265, 41°, Gardner lime 4,318-22 ft. TD 4,550 ft.

Throckmorton County: Payne-Johnston 1 Somerville, Sec. 282, BBB&C Sur., 5 mi. S Throckmorton. IP 212 BOPD, 16/64-in., TP 125 psi., GOR 362, 42°.

SOUTHWEST TEXAS

Duval County: Sunray Mid-Continent Oil Co. 2 Saenz, La Huerta Grant, A-227. IPP 146.88 BOPD, 20.8°, perfs. 3,052-67 ft., and (dual completion) 69.93 BOPD, 26°, perfs. 3,100-16 ft. TD 3,611 ft. (New pay —3,052-67 ft. — in Jaboncillos Creek field.)

Flourney Drilling Co. and West Pan Hydrocarbon Co. 2 Petra Lopez de Saenz Sur. (19 miles southwest of Freer). IP 95.98 BOPD (net), 9/64-in., 37°, 16 per cent water, perfs. 5,774-80 ft. TD 5,795 ft. (New field—Freeman.)

Duval Oil Co. 3 Hoffman, M. Ruiz Sur. 118, A-1975. IPP 36.62 BOPD (net), 22.4°, 94 per cent water, perfs. 2,945-47 ft. TD 3,481 ft. (New pay in Hoffman field.)

NORTH TEXAS

Knox County: Bobby M. Burns 1 Lee, 86-2-D&W, 2 mi. NW Knox City. IP 120.4 BOPD, 10/64-in., TP 85 psi., GOR 295, 38°, Tannehill sand 2,296-2,301½ ft. TD 2,556 ft. Suggested field name, Lee (Tannehill).

Knox County: Fletcher Oil & Gas Drilling Corp. 1 Moore, Sec. 100, Blk. 45, H&TC, 1½ mi. NW Goree. IPP 84.6 BOPD, 38°, GOR 220, Tannehill sand 1,908-09½ ft. TD 2,105 ft.

Perkins-Prothro 1 C. L. Mayes, 28-2-D&W 4 mi. NE Munday. IP 120 BOPD, ½-in., TP 75 psi., GOR 235, Tannehill sand, 1,903-13 ft. TD 2,100 ft. New field name, Mayes (Tannehill).

Montague County: The Texas Co. 1 Perry, M. B. Lewis Sur., A-424, 3 mi. W St. Jo. IPP 120 BOPD, 40°, GOR 254, conglomerate perforations 6,366-74 ft. TD 6,600 ft.

Montague County: Gulf Oil Corp. 1-A Hall, Sec. 47, Panola CSL Sur., 1½ mi. E Sunset. IP 40.76 BOPD, 1-in., TP 1,420-40 psi., GOR 940:1, 37°, conglomerate 5,899½-5,974 ft. TD 7,582 ft.

The Texas Co. 1 Zetzsche, Sec. 41, Hill CSL Sur., A-319, 1 mi. SE Bowie. Recompleted as Caddo limestone discovery. TD 6,557 ft., PB 6,094 ft., perforated lime 5,990-6,000 ft., IP 132 BOPD, 22/64-in., TP 100 psi., 41°, GOR 682.

Young County: Bennett Well Service 1 Kay, W. J. Hodges Sur., A-1457, Blk. 6, 5 mi. W Graham. IP 61 BOPD, 16/64-in., TP 80 psi., GOR 1000, sand 4,384-99 ft. TD 4,438 ft.

Young County: J. W. Hastings et al 2-A Holcomb, R. J. Fisher Sur., A-95, 7 mi. W Graham, new pay discovery in Karran North (Chappel lime) field. IP 840 BOPD, 24/64-in., TP 250 psi., GOR 850, 35°, Marble Falls comglomerate 4,280-85 ft. TD 4,665 ft.

Norman-Johnson 1-B Graham-Tankersley, TE&L Sur. 741, 10 mi. W Belnap. IP 120 BOPD, ¼-in., TP 120 psi. GOR 610, 38°, Strawn 3,526-31 ft. TD 3,578 ft.

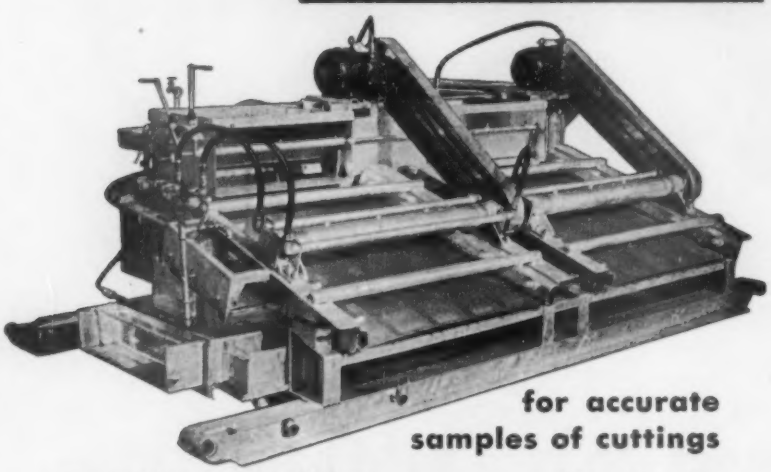
SOUTH LOUISIANA

Plaquemines Parish: Union Producing Co. and Sohio Petroleum Co. 4 Tambour, 29-22s-31e. IP 1,787 M.c.f. daily, $\frac{7}{16}$-in., wet gas (condensate volume unestimated), perfs. 8,267-77 ft. (Miocene). TD 11,500 ft. (New pay in West Bay area.)

Vermilion Parish: H. S. Cole, Jr., 1 Broussard, 23-13s-4e. IP 108 BCPD and 3,400 M.c.f. daily, 7/32-in., 52.4°, perfs. 11,194-11,212 ft. (Miocene). TD 12,334 ft. (Extension and new pay in Tigre Lagoon area.)

Thompson

DOUBLE VIBRATING SHALE SHAKER...and SAMPLE MACHINE



for accurate samples of cuttings

The THOMPSON SHALE SHAKER SAMPLE MACHINE offers the operator and geologist one of the best methods available for obtaining accurate foot-by-foot samples of well cuttings.

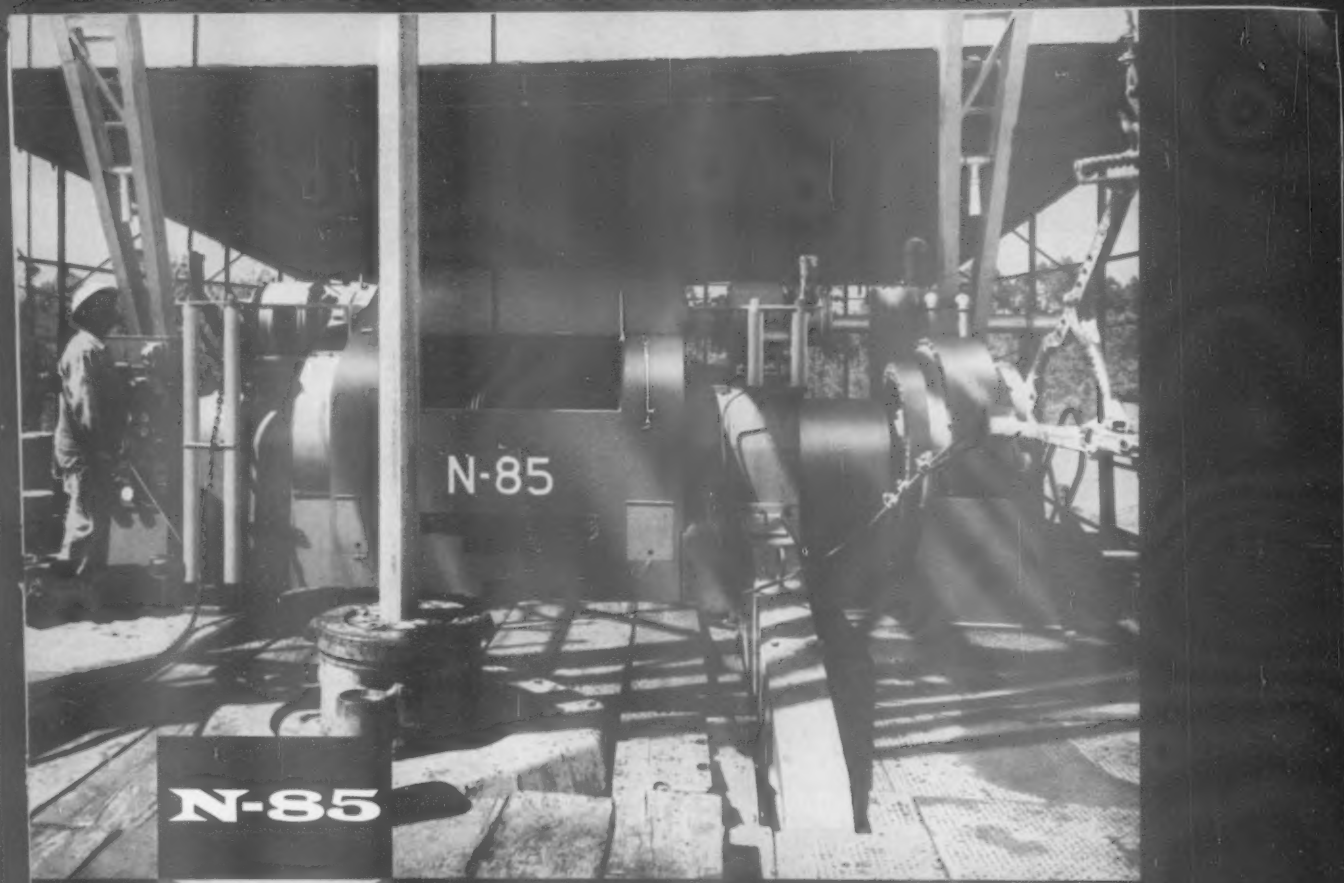
This THOMPSON DOUBLE VIBRATING SHALE SHAKER and SAMPLE MACHINE is specially engineered for off-shore barges or islands, deep wells, or wells using big volume and high pressure mud pumps. It is available either plain or galvanized, which makes it rust and deterioration-proof on off-shore or coastal duty

THOMPSON Shakers are famous for their highly efficient service at any depth or flow and for their economical first cost.

Make sure THOMPSON'S on the job for accurate samples and clean mud.

SOLD ONLY THROUGH SUPPLY STORES

Thompson TOOL CO. IOWA PARK, TEXAS



N-85

OVER 45 YEARS' EXPERIENCE

For More Hole at *Lower Cost*

See the N-85 Before You Buy!

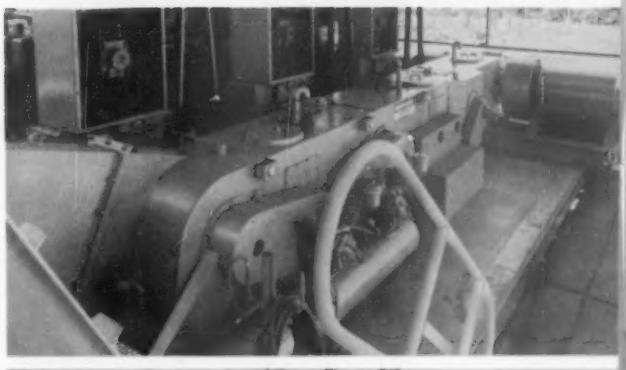
Here's the drawworks that pays off in extra hole on today's tougher, more competitive drilling. You get these advantages when you put the N-85 to work for you—more power at the drum with eight hoisting speeds—more power at the pumps with four rotary speeds holding down table RPM, plus precision control and ease of operation from full air controls.

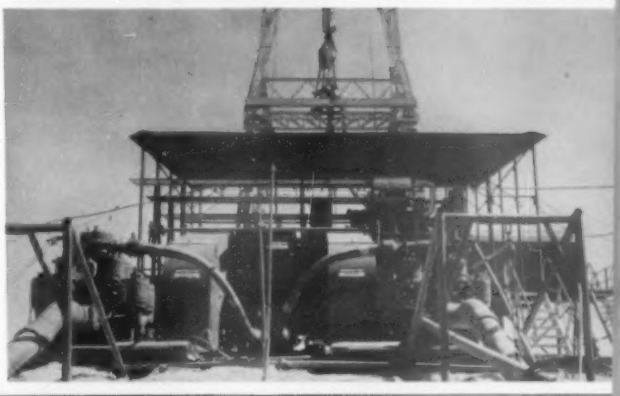
Brewster "Big Rig" Design in the N-85 gives you all of the proven *Reserve Power features* first introduced in the sensational Brewster N-95. Brakes, drum, shafting and chaining are all extra sized for a reserve of strength that sees you through when the going gets tough. Yet the N-85 moves in only three loads. The side skidded drawworks package includes the integrally mounted control panel and auxiliary brake as a single load.

Brewster has the facts and figures showing why contractors everywhere say Brewsters are your best investment. Ask for the field record on the N-85— WRITE TODAY

BREWSTER

N-85





Built to Stay-on-the-Job

With less down-time for servicing and repair, the N-85 is clean-of-line and laid out to facilitate every drilling operation. All major components are readily accessible . . . a feature that really pays off in more workability and lower maintenance costs. *Moving costs are lower, too—as the entire rig moves in three over-the-road packages.*

Two Heavy Duty Compounds

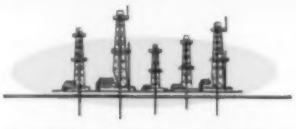
Compounds are available in heavy duty box design as shown or in separately skidded sectional design. Rig layout can be ordered for two or three level set-up. Engine drives arrangements include torque converter, fluid coupling and direct mechanical.

Dual Pump Drives

Dual in-line V-belt pump drives at rear of the compound simplify rigging up and manifolding . . . eliminate the need for idlers or notching the substructure.

Brief Specifications **Brewster N-85**

Recommended Horsepower	850	Overall Height	7' 2"
Drum Brakes (dia. x width)	46" x 10"	Overall Width	7' 11"
Drum Core (dia. x length)	24" x 49¼"	Overall Length	21' 0"
Drum speeds	8 fwd. & 2 rev.	Approx. Weight	37,000#—Less Catheads & Hydromatic
Transmission and Rotary Speeds	4 fwd. & 1 rev.		



THE BREWSTER COMPANY, INC.
Shreveport, Louisiana

Supply Houses

Howard Supply Company • Apex Equipment Company
Bovaird Supply Company • Industrial Supply Company
Murray Brooks, Inc. • United Supply and Manufacturing Company • For Canada, Mexico and Export Sales: The Brewster Company.

Brewster Matched Equipment

Model 300
Traveling Block

7-SX
Oilbath Swivel

RSH-22
Oilbath Rotary

With emphasis on experience . . .

. . . Sinclair Picks a Young Veep

THE youthful president of Sinclair Pipe Line Co. is clearing off his desk at Independence, Kans.

When 40-year-old William H. Morris moves to New York in the next few weeks he will become Sinclair Oil Corp.'s youngest vice president.

Recently he was named executive assistant to E. L. Steiniger, executive vice president in charge of operations for the big Sinclair parent organization. His promotion is a step toward broadening Sinclair's top-management structure, with emphasis on young executives.

In his new role he will help supervise crude-oil and gas production, refining, transportation, marketing, and research. But more than likely, he'll be called on frequently for his vast experience in pipelining.

Out in the field . . . Morris started out as a mail clerk for Sinclair Prairie Oil Co. in the basement of the old Sinclair Building in Tulsa. He was only 17 years old at the time. Within a short while he was knocking on management's door, asking to be sent out in the field.

In fact, he took a cut in pay to broaden his field experience.

"I wanted to learn more, so I haunted them 'til they sent me to East Texas with the gasoline department."

There they put him to work as a laborer, oiler, and tour engineer. When he was sent to Wyoming on another assignment, he got his first chance at a supervisory job. He became chief clerk in 1935, and hasn't stopped his climb from the basement since.

His knowledge of pipelining began in 1941—in the field again. This time it was West Chester, Pa., where he did engineering and construction work for Sinclair Refining Co. This was in the early development of Sinclair's products system, which now extends from Marcus Hook, Pa., via Chicago, to the Texas Coast.

Six years later he settled down at Independence, Kans., as manager of products lines. In 1951, when Sinclair Pipe Line Co. was formed to take over Sinclair Refining's lines, he became vice president and manager of crude-oil pipelines.

Thus, he was adding crude oil to his background of natural-gas and products transport.

Nation's youngest . . . When he was elected president of Sinclair Pipe Line in 1953, he was 37 years old—the youngest president ever appointed head of a major pipeline system.

WILLIAM H. MORRIS
. . . at 17, he knocked on the boss' door

Morris has combined his engineering education, supervisory ability, and experience in the field, and has come up with an early success in life.

College work at the University of Tulsa was sandwiched in between his mail-boy duties at Sinclair in 1933.

"This was in the depression, you know, and I was darned lucky to get any kind of job."

His schooling didn't end there. In fact, he's still taking courses. Last fall he completed 3 months in advanced management at Harvard's School of Business, and "I've still got a great deal to learn yet."

His phone is jangling even more since his vice presidency was announced —friends from all over the nation are congratulating him.

But some might have a hard time reaching him, because he just can't seem to get away from "the field." He recently returned from 10 days in Canada, and last week he was off again on a trip to New York. He, his wife, and their two boys—ages 2½ and 16 years—will soon make New York their permanent home.

In April Morris plans to head for Venezuela, where Sinclair Oil & Refining is helping Socony Mobil Oil Co. build a 212-mile crude line from San Silvestre field to Puerto Cabello. Chances are, with Sinclair's world-wide operations, his field trips will involve longer distances.

To what does he attribute his rapid success? Friends, family, and good luck, he says. "I take little credit myself."

But there's no doubt that hard work and experience in the field have been big contributing factors to Sinclair's youngest vice president.

R. K. O'Connell has been named zone exploration manager for Gulf Oil Corp. at Casper, Wyo. O'Connell was formerly zone landman for Gulf at Casper.

George N. Wilson, Sr., has been promoted by Seaboard Oil Co. from district production engineer to assistant production superintendent at Midland, Tex. **Alva G. Walsh** moves up from staff engineer to district engineer, replacing Wilson.

Dr. Enver Necdet Egeran, formerly vice president of the Turkish Petroleum Administration, has been appointed assistant to the manager of Mobil Exploration Mediterranean, Inc., Turkish producing affiliate of Socony Mobil Oil Co.

L. E. Ingham, vice president and director of Texas Gas Transmission Corp., has retired. He will remain a director of the company. Ingham joined Kentucky Natural Gas Corp., predecessor of Texas Gas Transmission, in 1939 as assistant to the president. He became vice president in 1943.

Roy J. Diwoky, formerly general manager of manufacturing and a director of American Oil Co., is scheduled to be elected president and a director of Commonwealth Oil Refining Co., Inc. He will headquarter in Ponce, Puerto Rico, where the company has a refinery. Diwoky joined Standard Oil Co. (Ind.) in 1935. He was executive vice president of Pan-Am Southern Corp., Indiana Standard subsidiary, before joining American Oil Co., another subsidiary, in 1956.

Paul V. Keyser, Jr., Socony Mobil Oil Co.,; **Peter T. Lamont,** Standard Oil Co. (N. J.), **A. N. Lilley,** The Texas Co.; and **J. A. McQuilkin,** Standard Vacuum Oil Co.; have been elected directors of the National Foreign Trade Council. **F. C. W. Paton,** Gulf Oil Corp., and **A. E. Thayer,** California Texas Oil Co., were reelected directors.

Personals

Walt Saner, division engineer at Enid, Okla., for Champlin Oil & Refining Co., has been promoted to chief engineer and transferred to Fort Worth. He replaces **Leo McCloskey,** who has resigned. Saner has been with the company since 1951. **Guy Bartgis** will succeed Saner as division engineer in Enid.

Von Rhea Frierson, formerly with Sahara Petroleum Co. in Egypt, has joined Oasis Oil Co. of Libya, subsidiary of Ohio Oil Co., as geologist.

G. B. MOODY

Graham B. Moody, Berkeley, Calif., consulting geologist, has been elected president of the American Association of Petroleum Geologists, succeeding **Theodore A. Link,** president of Cree Oil of Canada, Ltd. **Byron W. Beebe,** vice president and director of production for Keating Drilling Co., Oklahoma City, is new vice president of the association. Other officers are **William J. Hilseweck,** partner in Blackwood & Nichols, Dallas, secretary-treasurer; and **Sherman A. Wengerd,** associate professor of geology at the University of New Mexico, editor of the A.A.P.G. monthly bulletin.

Grant Bruesch, formerly with Leonard Blood, consulting geologist in Cushing, Okla., has joined Rich Oil Co. in Tulsa as chief geologist.

Ralph M. Barger, associate engineer in Los Angeles with the California state division of oil and gas, has been promoted to senior oil and gas engineer in charge of the division's Bakersfield, Calif., office. **Verne F. Gaede,** assistant engineer in Los Angeles, will succeed Barger as associate oil and gas engineer there.

C. C. Lillis, president of Southern Oil Co., has been elected chairman of the Kansas City Oil Men's Club. **A. L. Mallen,** Skelly Oil Co., is new first vice president. **Russell Harris,** Phillips Petroleum Co., is second vice president with **Dick Lane,** Bennett Pump Division, John Wood Co., as secretary-treasurer. Newly elected to the board of governors are **Richard B. Joyce,** Oil Information Committee; **J. N. Koontz,** Sinclair Refining Co.; and **W. G. Teaney,** Socony Mobil Oil Co. Lillis and Mallen will also serve on the board.

Robert E. Maples, process engineer at Continental Oil Co.'s Ponca City, Okla., refinery, has been appointed assistant superintendent of the company's Baltimore petrochemical plant.

J. E. Vaeth, executive vice president and director of Southern Production Co. before its absorption by Sinclair Oil & Gas Co., has resigned from Sinclair to become an independent operator in Fort Worth.

LeRoy Gideon, production superintendent of Rowan Oil Co., Fort Worth, has been elected a vice president. He will continue in charge of production for the company. Gideon was division geologist at Midland, Tex., for Rowan before becoming production superintendent in 1953.

Clanton Rylander, Jr., assistant division chief for Sinclair Refining Co. at Pasadena, Tex., has been named head of the light-oil division in the company's Houston refinery. **Bernard I. Bell** will replace Rylander at Pasadena.

Donald R. Johnson has been appointed division gas engineer in Gulf Oil Corp.'s gas utilization section, production department. Johnson has been with Gulf since 1940. **W. Atkins Goodwin** has been named unit supervisor of gas contracts unit for the company.

V. C. Georgescu, assistant coordinator of world-wide producing activities for Standard Oil Co. (N. J.), has been named associate London Middle East representative for the company. Georgescu has been with Jersey Standard's producing coordination department since 1947. Before that time he was president and board chairman of Romano-Americana, Jersey's Rumanian affiliate which was expropriated in 1948. In 1954 he was named vice president and a director of Near East Development Corp., one of the owners of Iraq Petroleum Co. and another affiliate.

Raymond A. Erickson, Robert A. Moody, and **William M. Swanson** have been assigned to the expanded petrochemical process sales department of Universal Oil Products Co. Erickson was formerly engineering economics supervisor for Armour Research Foundation, Chicago. Moody was with Humble Oil & Refining Co. before joining U.O.P. Swanson has been with U.O.P. since 1953.

C. W. MILLER

C. W. Miller, assistant manager of Warren Petroleum Corp.'s manufacturing division, has been named manager. **W. S. McAllister,** district superintendent at Gladewater, Tex., has been transferred to Tulsa as chief engineer in the engineering department. The company has also reorganized its manufacturing division to form three operating areas, each headed by a superintendent of operations, and has increased its operating districts from three to six. Area superintendents of operations are **L. M. Mauney,** northern area; **C. C. McKee,** southern area; and **E. C. Lindenberg,** Garvin County, Oklahoma, area. District superintendents are **E. K. Sloan,** Wichita Falls, Tex.; **F. E. Thompson,** Tulsa; **T. E. Raper,** Hobbs, N. M.; **Sam B. Summers,** Houston; **E. V. Hodge,** Gladewater, Tex., and **Guy Barritt,** Maysville, Okla. In other appointments, **Marvin Hindman,** superintendent of Warren's McLean, Tex., plant, has been moved to Conroe, Tex., as superintendent of Midland Gasoline Corp. plant there. **M. M. Burroughs,** formerly district clerk at the Garvin County plants, Maysville, will succeed Hindman at McLean. **J. W. Kearney,** Hobbs, N. M., has been named superintendent of Warren's Hawkins, Tex., plant, and **E. A. Yates,** plant foreman at Marlow, Okla., has been appointed superintendent at Maysville.

V. E. Fletcher, Skelly Oil Co. district superintendent at Pampa, Tex., has been promoted to southern area superintendent in Tulsa. He succeeds **C. L. Blacksher,** recently promoted to manager of production. Fletcher has been with Skelly since 1942. He became Pampa district superintendent in 1954. **C. B. McIntyre,** district foreman at Skellytown, Tex., will replace Fletcher at Pampa.

Fremont R. Schnieder of Shell Oil Co. was recently elected president of Petroleum Production Pioneers. **Ben E. Parsons,** retired General Petroleum Corp. executive, has been named honorary president of the group with **Frank R. Seaver** of Hydril Corp. as honorary vice president. **T. H. Wallace,** Western Gulf Oil Co., has been elected vice president. Other officers are **Douglas G. Kingman,** General Petroleum Corp., treasurer; **R. Sneddon,** Petroleum Club of Los Angeles, secretary; **Paul Andrews,** Signal Oil & Gas Co., historian; and **Thomas E. Morton,** Halliburton Oil Well Cementing Co., sergeant-at-arms.

W. G. COPELAND

William G. Copeland, manager of the operations division of The Texas Co.'s refining department, has been promoted to general manager of the refining department. He succeeds **Theodore A. Mangelsdorf,** recently elected a vice president. **Douglas P. Bailey,** assistant works manager of the Port Arthur, Tex., refinery since 1945, will replace Copeland as manager of the operations division. Copeland joined Texaco in 1927. Bailey has been with the company since 1922.

John R. Galloway drilling foreman for Ohio Oil Co. in Findlay, Ohio, has been appointed production foreman in Petersburg, Ind.

J. H. Colvin has been appointed head of the petroleum department, patent division, at Shell Development Co.'s Emeryville, Calif., research center.

Jack L. Tindale, formerly stationed at the Naval Auxiliary Air Station, Kingsdale, Tex., has been transferred to the Navy's Elk Hills petroleum reserve, Tupman, Calif., as production engineer.

Edmund Field has been named senior research associate at the Whiting, Ind., laboratories of Standard Oil Co. (Ind.). **Herbert N. Friedlander** has been appointed group leader.

Karl T. Feldman, Sinclair Pipe Line Co., has been elected a director of Platte Pipe Line Co. He succeeds **Angus A. Davidson,** recently appointed counsel for Sinclair Oil & Gas Co. and Sinclair Crude Oil Co.

J. J. Pickell, development engineer for Shell Oil Co., has been transferred to Salt Lake City from Ventura, Calif. **S. H. Hamann,** formerly in Long Beach, will succeed Pickell in Ventura. **G. W. Mikuls,** district production foreman in Ventura, has moved into the mechanical engineering department there.

Walter E. Biery, general manager of Mid-Continent Pipe Line Co., has been elected a vice president. He succeeds **R. H. Wills,** who has retired. Wills will remain a director of the company. Biery joined Mid-Continent in 1944 as chief gager and tank strapper. Before that time he was with the old Prairie Pipe Line Co. and Sinclair Pipe Line Co. With Mid-Continent he had been assistant superintendent, superintendent, superintendent of operations, and general superintendent, before becoming general manager.

Personals

James G. McIlhiney has been appointed district manager of Du Pont Co.'s new petroleum chemical division in Denver.

R. J. Ray, division geologist with Continental Oil Co. in Shreveport, La., since 1951, has resigned to join Coulston Drilling Co. in Tyler, Tex., as a geologist.

Harold V. Summers, formerly with Standard Oil Co. of Texas, has joined Cosden Petroleum Corp. as reservoir engineer in the production department in Big Spring, Tex.

Dwight H. Seely, Jr., has been appointed exploration manager of Sohio Petroleum Co.'s Gulf Coast division. He was formerly acting exploration manager.

Charles A. Schrader, president and director of Michigan - Ohio Pipeline Corp., Mount Pleasant, Mich., has been appointed vice president of supply and transportation for Leonard Refineries, Inc. He will supervise crude-oil purchasing, general purchasing, traffic, product orders and exchange, and transportation.

DEATHS

Edward J. Nolan, 68, Houston, oil man and former president of the Bank of America in Los Angeles, died February 4 in Houston.

George Bailey Stone, 54, Houston geologist and geophysicist for Phillips Petroleum Co., died January 26 in Bay City, Tex., while on a fishing trip. Stone had been with Phillips since 1944.

John K. Dorrance, 67, Houston, president of Dorrance & Co., drilling and exploration firm, died February 2 in Houston. Dorrance was discoverer of the Seno and Clodine oil fields.

Lee Barrett, 91, pioneer eastern Oklahoma oil man, died February 1 in Grove, Okla. Barrett entered the oil business in 1903 and was active in early development of the Nowata, Chelsea, Skiatook, and Haskell fields in Oklahoma.

William R. Wallace, 91, who helped organize Utah Oil Refining Co. in 1916, died recently in Salt Lake City of a stomach ailment.

Clarence W. Shay, 61, Montana oil producer who held widespread interests in Kevin-Sunburst oil field, died recently. Shay operated C. W. Shay Oil Co. and was part owner of Shay-Hesla Co.

Kurwin Robert Boyes, 60, secretary of the American Gas Association, died January 30 at his home in New York. Boyes had been secretary of A.G.A. since 1926.

Foster Brooks Parriott, 78, chairman of the executive committee and former board chairman of Sunray Mid-Continent Oil Co., died February 5 in Tulsa. Parriott entered the oil business as a roustabout and made an early success with the Benedum-Trees interests. As president of Transcontinental Oil Co. he helped open up the spectacular Yates field in Pecos County, Texas, in 1926. Transcontinental was merged with Ohio Oil Co. in 1930 and Parriott helped found Leader Oil Co., later sold to Carter Oil Co. in 1942. He became a director of Sunray in 1937, chairman of the board in 1943, and chairman of the executive committee in 1952.

George R. Goff, Sr., 73, Glenrock, Wyo., secretary of Lusk Royalty Oil Co., died recently. He was active in early development of Wyoming's Big Muddy and Lance Creek fields.

Charles W. Penchard, 102, who had received $170,000 in pension payments from Socony Mobil Oil Co. since his retirement from an $8,000-a-year job in 1924, died last week in New Rochelle, N. Y. Penchard went to work for the late John D. Rockefeller in 1869 at the age of 15. He worked in the Pennsylvania oil fields, in Europe, Asia, Baltimore, Philadelphia, and New York before retiring as manager of the company's paint and cooperage department.

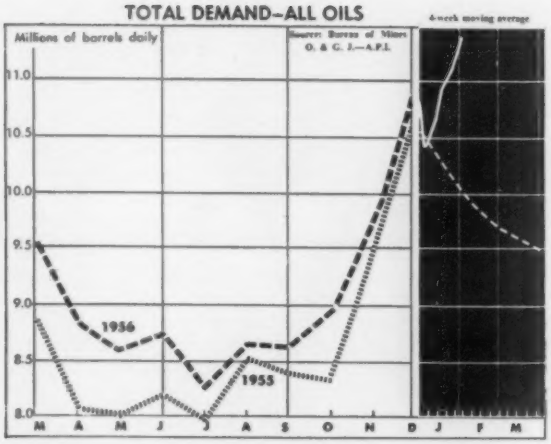
William B. Host, 60, Michigan drilling contractor, died January 25 after a heart attack.

W. M. Mitchell, 79, pioneer Texas oil producer, died January 31 in Houston. Mitchell worked in Spindletop field and later drilled the first well in Batson field.

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,424,105	UP	16,525	UP	271,553
Crude stocks	254,190,000	DOWN	2,088,000	DOWN	4,216,000
Completions	1,073	DOWN	23	UP	19
Refinery runs	8,202,000	UP	13,000	UP	134,000
Gasoline stocks	196,351,000	UP	3,103,000	UP	13,695,000
Kerosine stocks	24,622,000	DOWN	997,000	UP	4,265,000
Distillate stocks	100,369,000	DOWN	6,121,000	UP	16,139,000
Residual stocks	38,212,000	DOWN	1,319,000	DOWN	358,000
Four-product stocks	359,554,000	DOWN	5,334,000	UP	33,741,000
Total imports	1,408,600	UP	60,900	UP	600



Gasoline Prices Under More Pressure
Distillate and Residual Strong

WEAK gasoline markets and low gasoline prices on the Gulf Coast tend to influence prices on the Group 3 market. Mid-Continent gasoline competes with Gulf Coast gasoline along the Mississippi River at least as far down the river as Memphis.

The cost of moving gasoline from the Gulf Coast to Memphis is about half a cent a gallon. This means that spot gasoline prices in Memphis can't be more than about half a cent above the low price for the same material on the Gulf Coast.

Formal quotations for 87-octane gasoline on the Gulf Coast is 11.125 cents a gallon. Pipeline-grade regular gasoline in the Mid-Continent is 88 octane. If an eighth of a cent is added to the Gulf Coast price to adjust it to 88 octane, the price would be about 11.25 cents a gallon. Normal barge rates to Memphis of half a cent a gallon would result in a formal market low for regular gasoline at that point of 11.75 cents a gallon.

The market for 87-octane gasoline on the Gulf Coast is under less pressure than better-quality gasolines. There has been very little increase in export demand for gasoline because of the Suez crisis, but the small gain in demand has been for the lower grades. Since there is no great surplus of 87-octane gasoline at Gulf Coast refineries, the material most likely to move up the river in competition with Mid-Continent gasoline is 90-octane gasoline.

The low of formal quotations for 90-octane gasoline on the Gulf Coast is 11.5 cents a gallon. But, this grade is openly sold at 11.25 cents, and reports from the area indicate that plenty of this grade is available at 11.0 cents. This distress material can move up the river to Memphis at a delivered price of 11.5 cents. The result is a situation in which formal quotation for 88-octane gasoline at Memphis is 11.75 cents a gallon compared with 90-octane material from the gulf that can be delivered at 11.5 cents.

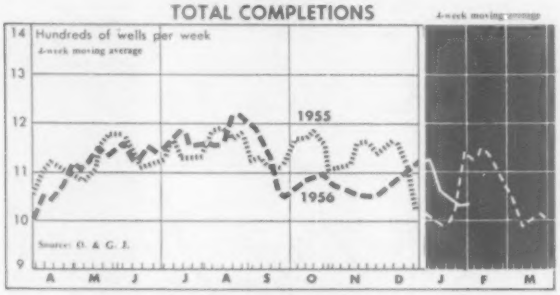
This condition limits the amount of surplus gasoline at refineries in Oklahoma that can move to markets along the Mississippi River. Some suppliers in the Group 3 area carry formal quotations of 12.5 cents a gallon for northern movement of regular gasoline, but many spot sales from terminals on the Great Lakes Pipe Line are at 12.0 cents.

Export and East Coast demands for distillates have cleaned out all of the reserve material on the Gulf Coast. Prices for kerosine and distillates moved up 0.25 cent a gallon within the past week. Market reports from the area show that customers still are offering premiums for deliveries over the remainder of this month.

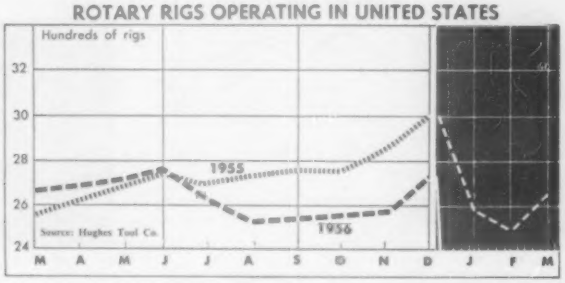
Residual is the tightest product on the Gulf Coast. Increased calls for heavy fuel come from Europe, East Coast, and from ship owners who buy bunkers for the round trip at this end.

The strike of tugboat and barge crewmen in New York Harbor cut down on fuel deliveries in the metropolitan area. Some tankers scheduled for New York were shifted to other discharge ports over the first few days of the month.

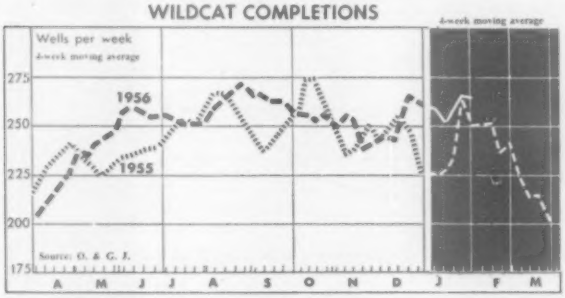
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



WILDCAT COMPLETIONS



ACTIVE ROTARY RIGS*

Area—	2-4-57	1-28-57	2-6-56
North Central and East	71	71	106
Southeast	32	33	31
Okla., Kans., Ark., Mo.	375	394	429
Louisiana	440	438	414
North and East Texas-Panhandle	349	378	369
Gulf and South Texas	213	229	278
West Texas-New Mexico	478	461	465
Rocky Mountain	198	205	202
Pacific Coast	108	101	133
Total United States	2,264	2,310	2,427
Western Canada	238	239	209

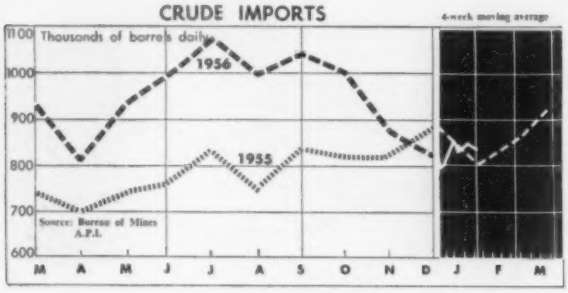
*Hughes Tool Co.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED FEBRUARY 2, 1957

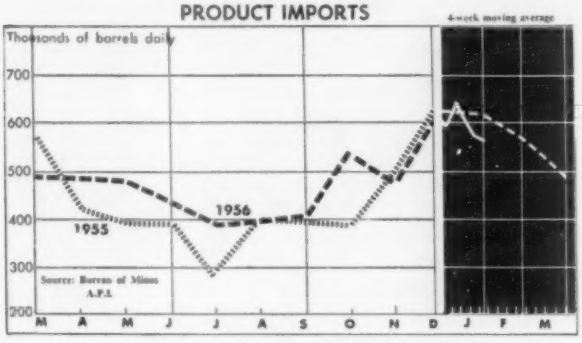
	Total of all wells					Cum.		Wildcat completions and discoveries					Cumulative total, 1957				
	Comp.	Oil	Gas	Dry	Footage	1957	1956	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	1	0	0	1	12,219	2	10	0	0	0	1	1	0	0	0	2	2
Arkansas	35	28	0	7	91,320	122	72	1	9	9	3	4	3	0	0	13	16
California	35	24	1	10	165,396	205	193	2	0	1	7	10	4	0	1	52	57
Colorado	18	2	2	14	93,573	122	120	1	0	0	12	13	4	0	1	81	86
Illinois	64	32	0	32	139,675	249	429	1	0	0	16	17	2	0	0	63	65
Indiana	11	6	0	5	16,037	67	65	0	0	0	0	0	3	0	0	8	11
Kansas	91	36	9	46	310,641	399	412	1	0	1	15	17	10	0	2	72	84
Kentucky	36	10	4	22	59,569	163	188	1	0	0	7	8	7	0	1	31	39
Louisiana	69	40	6	23	513,401	363	443	1	0	2	6	9	9	4	9	39	61
North	25	19	1	5	71,848	161	183	1	0	0	1	2	1	0	1	13	15
South	30	14	3	13	306,715	152	211	0	0	2	3	5	5	4	8	24	41
Offshore	14	7	2	5	134,838	50	49	0	0	0	2	2	3	0	0	2	5
Michigan	9	4	0	5	28,776	40	54	0	0	0	3	3	1	0	0	17	18
Mississippi	4	1	0	3	25,102	23	53	0	0	0	2	2	2	0	0	8	10
Montana	7	2	0	5	42,710	40	45	0	0	0	5	5	1	0	0	15	16
Nebraska	21	10	0	11	128,687	74	86	2	0	0	9	11	4	0	0	43	47
New Mexico	69	34	24	11	303,692	211	217	3	0	1	5	9	8	0	3	20	31
Northwest	29	3	23	3	111,100	83	81	1	0	1	1	3	4	0	2	6	12
Southeast	40	31	1	8	192,592	128	136	2	0	0	4	6	4	0	1	14	19
North Dakota	5	4	0	1	38,900	28	22	0	0	0	1	1	2	0	0	8	10
Ohio	23	13	4	*6	58,857	99	116	0	0	0	0	0	0	0	0	2	2
Oklahoma	131	64	3	†64	431,811	691	884	1	0	0	12	13	13	2	0	71	86
Pennsylvania-New York	1	0	1	0	7,585	22	70	0	0	1	0	1	0	0	2	3	5
Texas	412	226	16	170	1,740,438	2,078	1,994	13	1	3	116	133	74	4	25	530	633
Southwest (1 & 4)	60	28	4	28	235,727	241	304	1	0	1	24	26	7	2	11	88	108
Gulf Coast (2 & 3)	49	21	4	24	365,824	254	280	2	0	2	17	21	7	0	11	72	90
East (5 & 6)	22	9	0	13	136,112	120	107	1	0	0	11	12	3	0	0	36	39
N. Central (7-B & 9)	166	81	2	83	476,787	769	722	6	0	0	49	55	40	0	2	226	268
West (7-C & 8)	99	79	1	19	467,114	546	464	3	0	0	13	16	15	0	1	92	108
Panhandle (10)	16	8	5	3	58,874	148	117	0	1	0	2	3	2	2	0	16	20
Utah	2	2	0	0	11,767	15	3	1	0	0	0	1	3	0	0	6	9
West Virginia	15	2	8	5	47,437	77	49	0	0	0	2	2	0	0	5	2	7
Wyoming	14	4	1	9	67,389	90	80	1	0	0	3	4	6	0	0	25	31
Miscellaneous	0	0	0	0	0	11	9	0	0	0	0	0	0	0	1	4	5
Total United States	1,073	544	79	450	4,334,982	5,191	5,614	29	1	9	225	264	156	10	50	1,115	1,331
Total previous week	1,096	585	82	429	4,552,055	.....	.....	30	3	18	212	263	127	9	41	890	1,067
Total Feb. 4, 1956	1,054	544	83	427	4,118,176	.....	.....	32	0	5	193	230	161	22	37	1,066	1,286
Cumulative 1957	5,191	2,691	372	2,128	21,351,730	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

Service wells included: *4, †12.

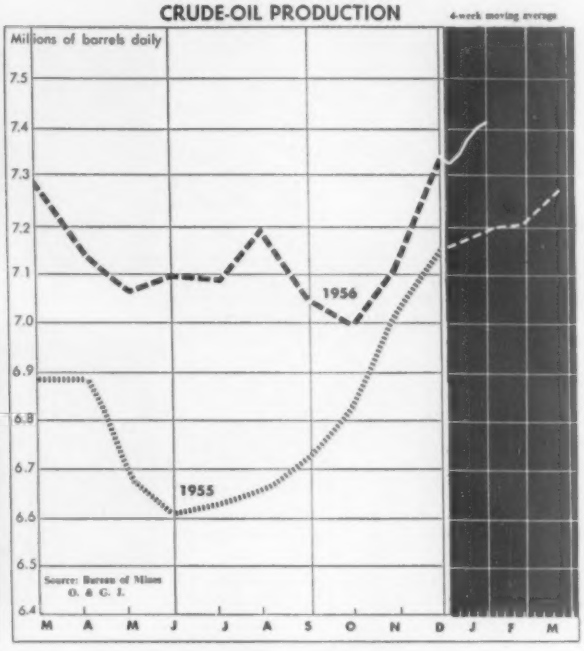
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE-OIL PRODUCTION

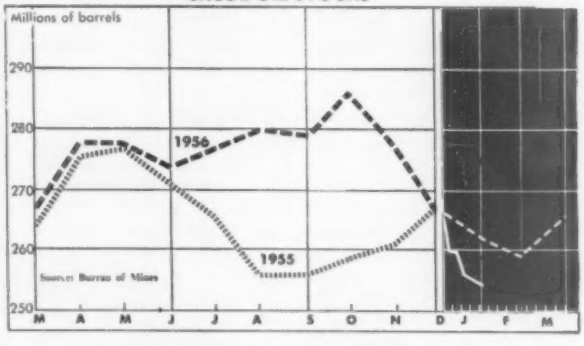


DAILY AVERAGE PRODUCTION FOR WEEK

	February 2, 1957			Jan. 26
	Crude oil	Lease condensate	Total	total
Alabama	11,500	.....	11,500	11,525
Arkansas	80,600	450	81,050	80,450
California	942,500	.....	942,500	945,000
Colorado	160,500	.....	160,500	159,200
Eastern	50,800	.....	50,800	51,400
Florida	1,300	.....	1,300	1,300
Illinois	230,400	.....	230,400	226,100
Indiana	32,300	.....	32,300	31,300
Kansas	†335,600	.....	†335,600	†345,900
Kentucky	48,000	.....	48,000	47,800
Louisiana	899,300	80,900	980,200	979,050
North	129,300	2,900	132,200	131,050
South	770,000	78,000	848,000	848,000
Michigan	26,300	.....	26,300	26,000
Mississippi	108,725	5,100	113,825	113,825
Montana	69,200	.....	69,200	68,950
Nebraska	38,650	.....	38,650	37,850
Nevada	100	.....	100	100
New Mexico	245,930	4,850	250,780	251,280
North Dakota	41,450	.....	41,450	37,650
Oklahoma	†618,050	.....	†618,050	†606,700
Texas	3,023,000	56,150	3,079,150	3,079,150
Dist. 1	55,500	575	56,075	56,075
Dist. 2	145,500	8,750	154,250	154,250
Dist. 3	432,500	26,000	458,500	458,500
Dist. 4	230,000	6,700	236,700	236,700
Dist. 5	39,500	550	40,050	40,050
Dist. 6	130,000	6,300	136,300	136,300
East Texas field	207,000	.....	207,000	207,000
Dist. 7-B	162,000	75	162,075	162,075
Dist. 7-C	168,000	4,600	172,600	172,600
Dist. 8	1,143,000	1,450	1,144,450	1,144,450
Dist. 9	209,000	850	209,850	209,850
Dist. 10	101,000	300	101,300	101,300
Utah	9,950	.....	9,950	10,750
Wyoming	302,400	.....	302,400	296,200
Others	‡100	.....	‡100	‡100
Total U. S.	7,276,655	147,450	**7,424,105**	7,407,580
Change from prev. week, up			**16,525**	.....
Canada	†530,400	.....	†530,400	†563,400
Total U. S. prod., January 1-February 2			244,548,945 bbl.	
Same period last year (crude plus cond.)			*237,465,100 bbl.	

*Includes 4,127,200 bbl. condensate. †Week ended previous Monday. ‡South Dakota.

CRUDE-OIL STOCKS

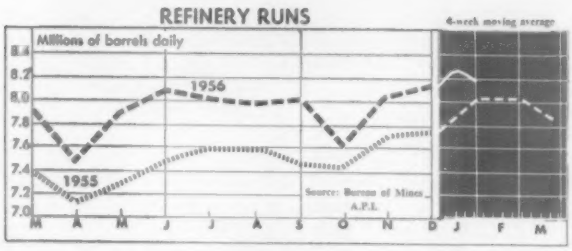


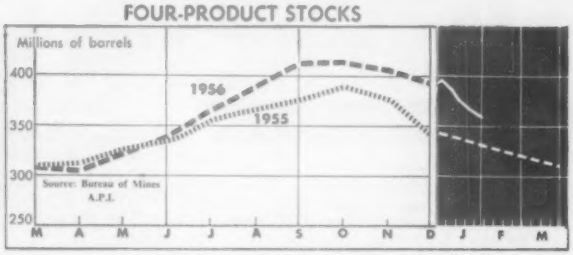
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

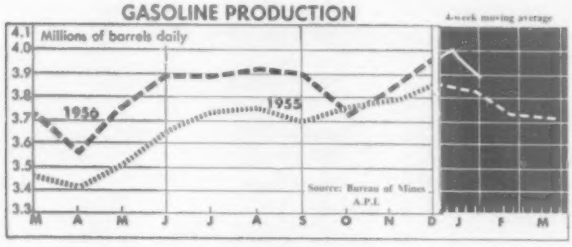
(Thousands of barrels)

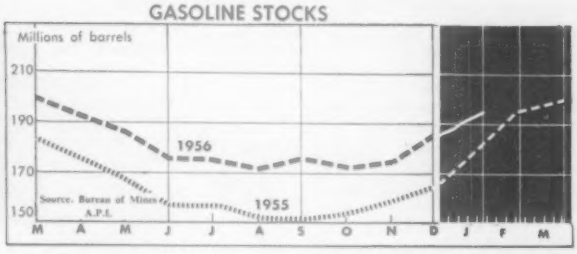
	1-26-57	1-19-57	1-28-56
Pennsylvania Grade	2,335	2,318	2,680
Other Appalachian	2,260	2,117	2,119
Illinois, Indiana, Michigan	10,888	10,887	9,112
Nebraska, North Dakota	1,965	2,042	2,213
Kansas	9,633	9,746	8,065
Oklahoma	21,529	22,782	22,060
Arkansas	2,821	2,680	2,125
Louisiana	18,647	18,588	16,066
North	2,837	2,782	2,658
South	15,810	15,806	13,408
Mississippi	2,807	2,633	2,978
New Mexico	7,815	8,015	7,730
Texas	113,403	113,294	123,369
East Texas proper	8,885	9,005	8,753
West Texas	53,565	53,264	58,946
Texas Gulf	21,200	21,992	24,616
Other Texas	29,753	29,033	31,054
Wyoming	16,036	16,378	15,616
Other Rocky Mountain	5,878	6,487	5,638
California	27,396	27,742	27,483
Foreign	†10,787	10,569	11,152
Total	254,190	256,278	258,406

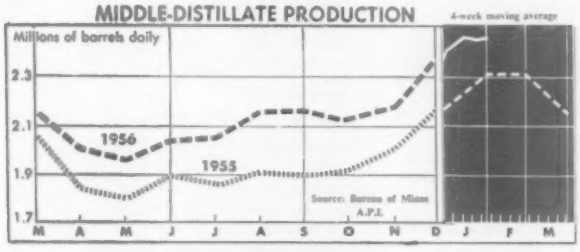
*Bureau of Mines †Includes 2,338,000 bbl. in California.

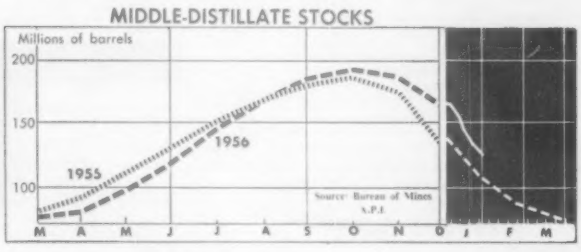


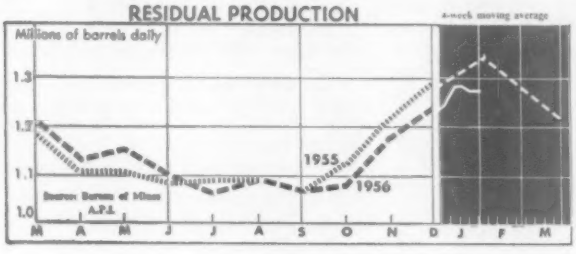


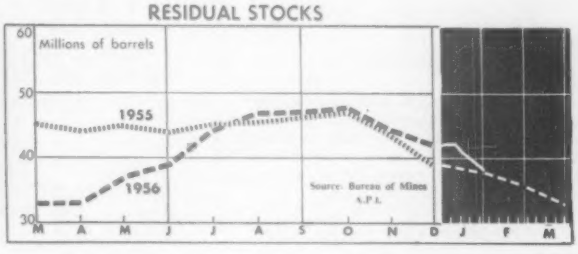

GASOLINE PRODUCTION
Millions of barrels daily
4-week moving average
1956
1955
Source: Bureau of Mines A.P.I.
M A M J J A S O N D J F M




MIDDLE-DISTILLATE PRODUCTION
Millions of barrels daily
4-week moving average
1956
1955
Source: Bureau of Mines A.P.I.
M A M J J A S O N D J F M




RESIDUAL PRODUCTION
Millions of barrels daily
4-week moving average
1955
1956
Source: Bureau of Mines A.P.I.
M A M J J A S O N D J F M



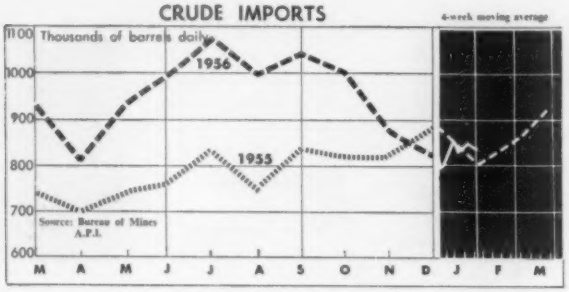
A.P.I. REFINERY REPORT, FEBRUARY 1, 1957

(Thousands of barrels)

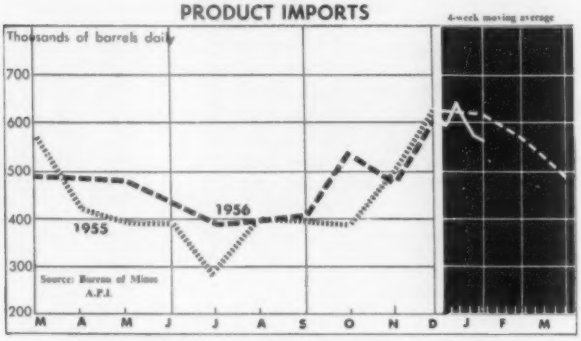
District—	Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.	Stocks‡—Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, February 1956—Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.
East Coast	1,205	492.2	54.3	381.7	215.9	40,783	10,243	36,023	8,818	1,116	463.4	42.3	304.3	239.6
Appalachian:														
District 1	99	40.3	8.0	24.9	7.1	4,855	513	2,410	412	99	39.7	4.8	25.6	9.3
District 2	107	52.1	5.2	17.7	18.4	3,001	365	734	288	107	52.5	7.0	21.2	15.1
Ind., Ill., Ky.	1,429	767.7	76.3	343.6	201.1	35,770	4,845	14,917	4,658	1,423	710.5	78.5	302.8	199.2
Minn., Wis., Dak.	101	50.3	8.0	27.4	6.6	7,155	954	5,613	222	92	43.4	11.9	17.0	9.2
Okla., Kans., Mo.	714	382.6	18.7	182.0	40.1	18,753	1,181	9,271	1,192	715	399.4	15.8	188.3	41.4
Inland Texas	274	199.4	3.0	58.1	19.0	8,417	477	1,689	1,860	275	182.7	9.7	50.5	28.3
Texas Gulf Coast	1,994	867.0	125.7	567.9	257.9	27,495	2,783	8,971	6,051	2,025	888.9	138.9	553.1	258.4
La. Gulf Coast	711	337.4	85.9	198.3	52.9	12,020	1,878	5,189	1,639	692	325.0	55.2	204.8	63.5
N. La. and Ark.	101	38.1	8.0	27.3	7.0	5,446	708	2,167	233	95	36.4	9.3	20.6	5.8
Rocky Mountain:														
New Mexico	28	14.4	0.4	4.7	3.0	504	11	88	64	21	11.8	0.4	3.2	3.1
Other Rocky Mtn.	297	140.2	2.7	71.7	40.1	6,835	329	2,445	927	278	130.1	4.2	66.0	44.2
West Coast	1,142	498.6	7.4	182.6	371.9	25,317	335	10,852	11,848	1,109	461.5	7.0	160.6	368.8
Feb. 1, 1957	8,202	3,880.3	403.6	2,087.9	1,241.0	196,351	24,622	100,369	38,212	8,047	3,745.3	385.0	1,918.0	1,285.9
Jan. 25, 1957	8,189	3,835.7	355.3	2,047.6	1,243.1	183,248	25,619¶	106,490	39,531	.....	.....	.....	.....	.....
Feb. 3, 1956	8,068	3,734.1	402.0	1,933.6	1,334.4	182,656	20,357	84,230	38,570	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines. ¶Revised.

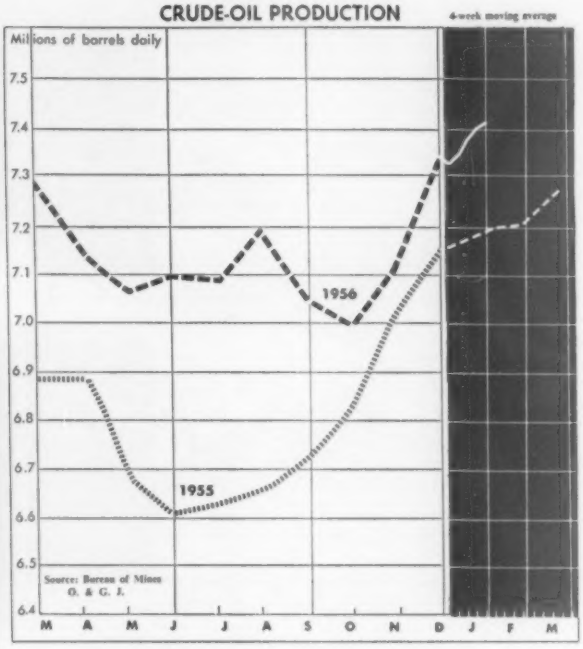
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE-OIL PRODUCTION

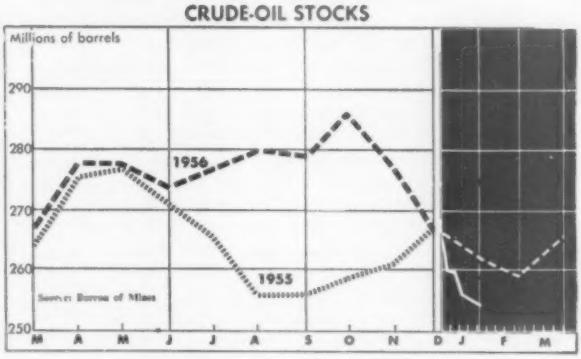


DAILY AVERAGE PRODUCTION FOR WEEK

	February 2, 1957			Jan. 26
	Crude oil	Lease condensate	Total	total
Alabama	11,500	.....	11,500	11,525
Arkansas	80,600	450	81,050	80,450
California	942,500	.....	942,500	945,000
Colorado	160,500	.....	160,500	159,200
Eastern	50,800	.....	50,800	51,400
Florida	1,300	.....	1,300	1,300
Illinois	230,400	.....	230,400	226,100
Indiana	32,300	.....	32,300	31,300
Kansas	†335,600	.....	†335,600	†345,900
Kentucky	48,000	.....	48,000	47,800
Louisiana	899,300	80,900	980,200	979,050
North	129,300	2,900	132,200	131,050
South	770,000	78,000	848,000	848,000
Michigan	26,300	.....	26,300	26,000
Mississippi	108,725	5,100	113,825	113,825
Montana	69,200	.....	69,200	68,950
Nebraska	38,650	.....	38,650	37,850
Nevada	100	.....	100	100
New Mexico	245,930	4,850	250,780	251,280
North Dakota	41,450	.....	41,450	37,650
Oklahoma	†618,050	.....	†618,050	†606,700
Texas	3,023,000	56,150	3,079,150	3,079,150
Dist. 1	55,500	575	56,075	56,075
Dist. 2	145,500	8,750	154,250	154,250
Dist. 3	432,500	26,000	458,500	458,500
Dist. 4	230,000	6,700	236,700	236,700
Dist. 5	39,500	550	40,050	40,050
Dist. 6	130,000	6,300	136,300	136,300
East Texas field	207,000	.....	207,000	207,000
Dist. 7-B	162,000	75	162,075	162,075
Dist. 7-C	168,000	4,600	172,600	172,600
Dist. 8	1,143,000	1,450	1,144,450	1,144,450
Dist. 9	209,000	850	209,850	209,850
Dist. 10	101,000	300	101,300	101,300
Utah	9,950	.....	9,950	10,750
Wyoming	302,400	.....	302,400	296,200
Others	‡100	.....	‡100	‡100
Total U. S.	7,276,655	147,450	**7,424,105**	7,407,580
Change from prev. week, up			**16,525**	.....
Canada	†530,400	.....	†530,400	†563,400
Total U. S. prod., January 1-February 2				244,548,945 bbl.
Same period last year (crude plus cond.)				*237,465,100 bbl.

*Includes 4,127,200 bbl. condensate. †Week ended previous Monday. ‡South Dakota.

CRUDE-OIL STOCKS

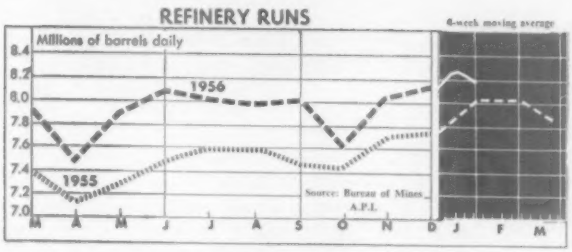


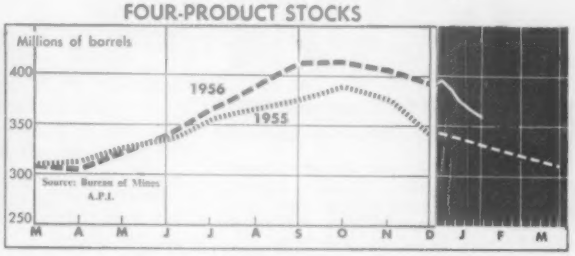
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

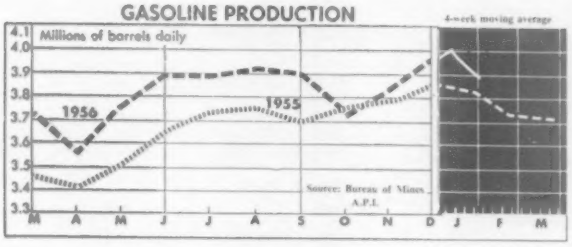
(Thousands of barrels)

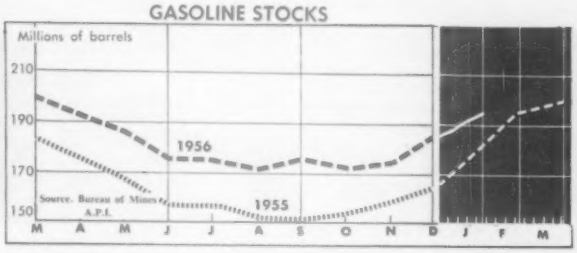
	1-26-57	1-19-57	1-28-56
Pennsylvania Grade	2,335	2,318	2,680
Other Appalachian	2,260	2,117	2,119
Illinois, Indiana, Michigan	10,888	10,887	9,112
Nebraska, North Dakota	1,965	2,042	2,213
Kansas	9,633	9,746	8,065
Oklahoma	21,529	22,782	22,060
Arkansas	2,821	2,680	2,125
Louisiana	18,647	18,588	16,066
North	2,837	2,782	2,658
South	15,810	15,806	13,408
Mississippi	2,807	2,633	2,978
New Mexico	7,815	8,015	7,730
Texas	113,403	113,294	123,369
East Texas proper	8,885	9,005	8,753
West Texas	53,565	53,264	58,946
Texas Gulf	21,200	21,992	24,616
Other Texas	29,753	29,033	31,054
Wyoming	16,036	16,378	15,616
Other Rocky Mountain	5,878	6,487	5,638
California	27,396	27,742	27,483
Foreign	†10,787	10,569	11,152
Total	254,190	256,278	258,406

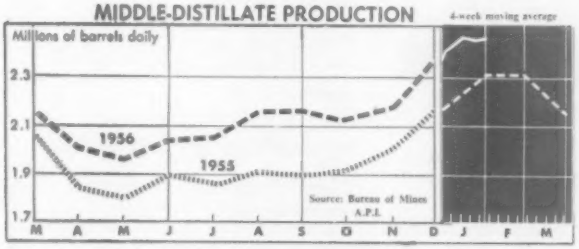
*Bureau of Mines †Includes 2,338,000 bbl. in California.

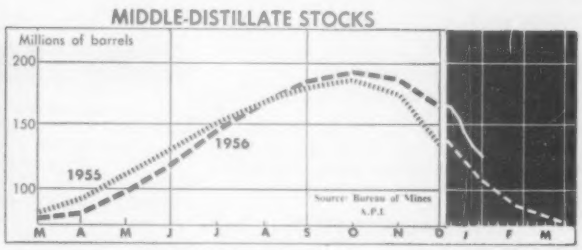


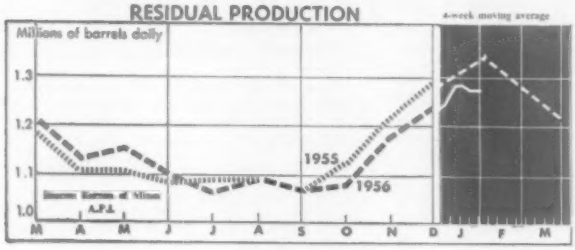


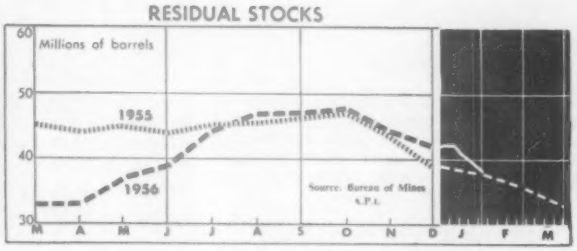












A.P.I. REFINERY REPORT, FEBRUARY 1, 1957

(Thousands of barrels)

District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, February 1956 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,205	492.2	54.3	381.7	215.9	40,783	10,243	36,023	8,818	1,116	463.4	42.3	304.3	239.6
Appalachian:														
District 1	99	40.3	8.0	24.9	7.1	4,855	513	2,410	412	99	39.7	4.8	25.6	9.3
District 2	107	52.1	5.2	17.7	18.4	3,001	365	734	288	107	52.5	7.0	21.2	15.1
Ind., Ill., Ky.	1,429	767.7	76.3	343.6	201.1	35,770	4,845	14,917	4,658	1,423	710.5	78.5	302.8	199.2
Minn., Wis., Dak.	101	50.3	8.0	27.4	6.6	7,155	954	5,613	222	92	43.4	11.9	17.0	9.2
Okla., Kans., Mo.	714	382.6	18.7	182.0	40.1	18,753	1,181	9,271	1,192	715	399.4	15.8	188.3	41.4
Inland Texas	274	199.4	3.0	58.1	19.0	8,417	477	1,689	1,860	275	182.7	9.7	50.5	28.3
Texas Gulf Coast	1,994	867.0	125.7	567.9	257.9	27,495	2,783	8,971	6,051	2,025	888.9	138.9	553.1	258.4
La. Gulf Coast	711	337.4	85.9	198.3	52.9	12,020	1,878	5,189	1,639	692	325.0	55.2	204.8	63.5
N. La. and Ark.	101	38.1	8.0	27.3	7.0	5,446	708	2,167	233	95	36.4	9.3	20.6	5.8
Rocky Mountain:														
New Mexico	28	14.4	0.4	4.7	3.0	504	11	88	64	21	11.8	0.4	3.2	3.1
Other Rocky Mtn.	297	140.2	2.7	71.7	40.1	6,835	329	2,445	927	278	130.1	4.2	66.0	44.2
West Coast	1,142	498.6	7.4	182.6	371.9	25,317	335	10,852	11,848	1,109	461.5	7.0	160.6	368.8
Feb. 1, 1957	8,202	3,880.3	403.6	2,087.9	1,241.0	196,351	24,622	100,369	38,212	8,047	3,745.3	385.0	1,918.0	1,285.9
Jan. 25, 1957	8,189	3,835.7	355.3	2,047.6	1,243.1	183,248	25,619¶	106,490	39,531	.....	.....	.....	.....	.....
Feb. 3, 1956	8,068	3,734.1	402.0	1,933.6	1,334.4	182,656	20,357	84,230	38,570	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines. ¶Revised.

Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):

Regular (88 octane)	12.00-12.25
Premium (96 octane)	13.75-14.00

Gulf Coast (cargoes for coastwise or export movements):

Regular (90 octane)	11.25-11.50
Regular (92 octane)	11.50-11.75
Premium (97 octane)	13.25-13.50
Premium (98 octane)	13.50-14.00

California (rack):

★ Regular (84 octane)	13.1
★ Premium (93 octane)	14.1
★ Premium (96 octane)	15.1

Caribbean area (cargoes):

★ Regular (87 octane)	11.00
Premium (93 octane)	11.75

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:

Grade 26-70	5.0

Breckenridge:

Grade 26-70	4.5

*If 26-70 natural is considered as 100 per cent, prices for lower-vapor-pressure grades increase 2.5 per cent for each unit drop in Reid vapor pressure down to and including 16-lb. Prices for grades below 16-lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):

Kerosine 42-44	10.625-10.75
Diesel oil (58 d.i. and above)	10.25-10.50
Distillate No. 1	10.25-10.50
Distillate No. 2	9.625-9.75

Gulf Coast (cargoes):

★ Kerosine 41-43	10.75-11.25
★ Distillate No. 2	10.25-10.75

New York Harbor (barges):

Kerosine 41-43	12.25
Distillate No. 2	11.65
Diesel fuel, 48-52 d.i.	11.95

Caribbean area (cargoes):

★ Distillate No. 2	10.25

WAX (LB.)

Oklahoma (Group 3):

132-135 A.m.p. (semi-refined) in tank cars	6.50

New York (export):

126-130 A.m.p. crude scale (solid in bags or barrels)	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$2.45-2.70
Gulf Coast (cargoes):	
★ Bunker C fuel	$2.75-3.25
New York Harbor (barges):	
Bunker C fuel	$3.30-3.40
Caribbean (cargoes):	
Bunker C	$2.55
California (rack):	
★ Bunker C fuel, Los Angeles	$2.75-3.00

LUBRICATING OILS

Mid-Continent (Group 3):	
150-160 bright stock, solvent refined, 0-10 p.p., 95 v.i.	25.5
200 vis. neutral oil, solvent refined, 0-10 p.p., 95 v.i.	22.25
Pennsylvania Grade:	
145-155 vis. at 210, bright stock, 8 color, 25 p.t.	28
200 vis. neutral (180 at 100°), 25 p.t.	26

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Mid-Cont.*	Gulf Coast Tex.†	West Tex.‡ N.M.	Wyo. (sour)
14-14.9	$2.52	....	....	....	....
15-15.9	2.56	....	....	....	$1.89
16-16.9	2.61	....	....	....	1.94
17-17.9	2.66	....	....	....	1.99
18-18.9	2.71	....	....	....	2.04
19-19.9	2.77	....	....	....	2.09
20-20.9	2.83	$2.75	....	$2.62	2.14
21-21.9	2.89	2.77	....	2.64	2.19
22-22.9	2.94	2.79	....	2.66	2.24
23-23.9	2.99	2.81	$3.44	2.68	2.29
24-24.9	3.04	2.83	3.46	2.70	2.34
25-25.9	3.08	2.85	3.48	2.72	2.39
26-26.9	3.13	2.87	3.50	2.74	2.44
27-27.9	3.17	2.89	3.52	2.76	2.49
28-28.9	3.21	2.91	3.54	2.78	2.54
28-29.9	3.25	2.93	3.56	2.80	2.59
30-30.9	3.29	2.95	....	2.82	2.63
31-31.9	3.33	2.97	....	2.84	2.67
32-32.9	3.37	2.99	....	2.86	2.71
33-33.9	3.41	3.01	....	2.88	2.75
34-34.9	3.45	3.03	....	2.90	2.79
35-35.9	3.49	3.05	....	2.92	2.83
36-36.9	3.53	3.07	....	2.94	2.87
37-37.9	3.57	3.09	....	2.96	2.89
38-38.9	....	3.11	....	2.98	2.91
39-39.9	....	3.13	....	3.00	2.93
40 and up	....	3.15	....	3.02	2.95

*Includes Oklahoma, most of Kansas, North Dakota, West Texas (sweet) and North Central Texas. †Low cold test Gulf Coast. ‡Sour.

Effective dates: California, January 17, 1957, east of California, January 3-January 10, 1957; Pennsylvania Grade, January 16, 1957.

Some crudes in North Central Texas and West Central Texas, are on the intermediate schedules.

FLAT PRICES

Louisiana:

Bienville (distillate)	$3.05
Ville Platte	3.45

Texas:

East Texas	3.25
Conroe	3.53
Van	3.08

Pennsylvania Grade:

Bradford	4.88
Middle District	4.70
Southwest Pennsylvania	4.41
West Virginia	4.23
Buckeye Grade	4.23
Zanesville Grade	3.27
Illinois Basin	**3.15**

Canada:

Leduc-Woodbend (flat prices D-2), D-3)	2.78
Redwater (Alta.) D-3	2.67
Smiley-Viking (Sask.)	2.44
Pembina	2.65

FOREIGN

Venezuela:

Cumarebo, 48°-49.9°, Tucupido	3.75
San Joaquin, 40°-40.9°, Puerto La Cruz	3.37
Oficina, 35°-35.9°, Puerto La Cruz	3.05
Tia Juana medium, 26.5°-26.9°, Amuay*	2.55
Quiriquire, 16.5°-16.9°, Caripito	2.45
Lagunillas heavy, flat, Amuay or Las Piedras*	2.38
Bachaquero, flat, Las Piedras*	2.23

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Middle East, Persian Gulf (cargoes, f.o.b. lifting port):

Arabian, 36.0°-36.9°, Ras Tanura	$1.97
Iranian, 34.0°-34.9°, Bandar Mashur	1.91
Iranian, 34.0°-34.9°, Abadan	1.86
Iraq, 36.0°-36.9°, Fao	1.87
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.72
Qatar, 39.0°-39.9°, Umm Said	2.06

Middle East, E. Mediterranean:

Arabian, 36.0°-36.9°, Sidon	2.69

Far East (cargoes, f.o.b. Lutong, Sarawak):

Seria Light, 37°-38°	2.60

TANKER RATES PER LONG TON

(Latest reported spot fixtures)

★ Gulf-U.S.N.H., dirty (USMC +167.5%)	$7.62
★ N.W.I.-U.S.N.H., dirty (Scale+240%) (57s. 6d.)	8.05
★ Gulf-U.K., clean (Scale+305%) (155s. 7d.)	21.78
N.W.I.-U.K., dirty (Scale+275%) (121s. 11d.)	17.06
★ P.G.-France, dirty (Scale+340%) (354s. 7d.)	49.64

Your MARKET PLACE FOR THE OIL AND GAS INDUSTRY...

CLASSIFIED ADVERTISING

UNDISPLAYED CLASSIFIED 26c a word one issue. 10% Discount three or more consecutive issues. $5.00 minimum charge. Blind Box in our care nine words. Payable in Advance.

DISPLAY CLASSIFIED
$18.00 a column inch one issue . . . . 10% Discount three or more consecutive issues.

Address Classified Advertising Material: The Oil and Gas Journal, P. O. Box 1260, Tulsa 1, Okla.

FOR SALE EQUIPMENT

FAILING 1500 H.D. drill with 4½x6 pump, automatic pulldown, mounted on 1948 F7 Ford. Also Griffin water tank, mounted on 1951 Ford. Write P. O. Box 819, Longmont, Colorado. Phone 1333.

2—55,000 BBL. all steel storage tanks, 5 ring, sheets 6' x 20'6" long, complete in every detail, cleaned & ready to dismantle. Will reerect any place in U. S. or cut down and load on cars. Tonkawa, Okla. Atlas Tank & Steel, Inc. Phone 950.

7,500' 4½" 10.80 lbs., lap weld, good body, threads and couplings. Suitable for casing. 75c. M. J. Regan Pipe Co., Coffeyville, Kans.

SAL 5000 FRANKS Rotary. Two WAK Waukesha engines recently overhauled, 96' Franks Derrick, 7⅛x14 Oilwell Pump, 4000' 4½" Drill Pipe, 30' House trailer, and Ford F-600 with Poletrailer with rig. All equipment necessary with extras. Located North Central Oklahoma. Priced to sell. Box J-930, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE EQUIPMENT

OIL & GAS SEPARATOR—B. S. & B. 500# W.P. Vertical—20" x 8'6" Type I-205—Used 6 months. BOSWELL-FRATES CO., 1003 Kennedy Building, Tulsa, Oklahoma.

CORE DRILLS, SPUDDERS, ROTARIES. New and used equipment. Everything in supplies. Fishing tools rented. Pressey & Son, Pueblo, Colo.

1955 MODEL 1000 Mayhew Combination Air and Water Drilling Rigs. Also 315 cfm Schramm Diesel Air Compressors. V. M. Shortes, Box 127, Lovington, New Mexico. Phones 6-7591 or 8533.

STEEL PIPE & TUBING
• CHROME MOLY • CARBON MOLY
• MONEL • CARBON STEEL • STAINLESS
Widest Range of Sizes & Specs in the U. S.
WRITE FOR STOCK LIST
MIDCONTINENT TUBE SERVICE, INC.
2308 Oakton St., Evanston, Ill. DA 8-4030

FOR SALE EQUIPMENT

FOR SALE . . .
2000—10¾"
No. 1 Good Used
RECESSED LINE COUPLINGS
(Like New)
FOR PRICE, TELEPHONE COLLECT:
CHESTER REICHERT
PRospect 6-1808 - St. Louis, Mo.

FOR SALE
2" External Upset Tubing

200,000' Brand New E.W. Range 2 prime, tested, 3500 PSI with API couplings and threads at $65.00 CFT delivered in carload lots only.

Orders will be filled on first come, first served basis, and this price will apply for a limited time only. Suggest you wire or phone order at once.

A. J. STRUBEL
4946 MURDOCH
ST. LOUIS 9, MO.
Day: PRospect 2-2100
Nite: FLanders 1-9152

BRILL BUYS—THE BEST!

NEAR LONGVIEW, TEXAS
FORMER LACY REFINERY

1—Wyatt 30" x 70' Stabilizer 160# 30 tray
1—5' x 96' tower, 40 tray, 135# WP.
1—2' x 50' tower, 24 trays.
1—Ethyl lead plant.
2—Convection furnaces, 20 MIL BTU/hr.
8—Welded storage tanks, 5,000, 2,000 bbl.
8—Hi-vol pumps, 10 x 7 x 18, 10 x 6 x 12, 6 x 4 x 12, 6 x 3 x 8.
Large Selection of Series 15, 30 Steel Valves, 1" to 8"

VESSELS
2—12' x 45' Butane Tanks, 125#
2—12' x 45' Storage Tanks, 25#
1—14' x 21' Clay Tower, 125#
1—8' x 75' Tower, 20 Trays, 25#
1—18" x 32' Tower, 15 Trays, 160#
2—8½' x 25' Tanks 50#

HOT-OIL PUMPS
3 Pacific ITB, 400 gpm—2,000' hd, 735 gpm—3,100' hd.
5 Pacific SVTB, 612 gpm—600' hd, 324 gpm—400' hd, 308 gpm—516' hd, 193 gpm—389' hd.
1 Pacific HVTB (unused) 1270 GPM—408' Hd.
BJ hot oil pump 3 x 9, 13 st, 325 gpm, 4600' hd.

IN STOCK

HEAT EXCHANGERS
3—Kellogg Adm. Ftg. Hd. 2200, 1800 Sq. Ft., 315#
4—Kellogg Stel Ftg. Hod. 800, 650, 500 Sq. Ft.
18—GR Fin Tubes, 73 Sq. Ft.
6—Brown fintube exchangers, 300# 140 Sq. Ft. 4-6 chrome.
6—Adm. 785, 742, 425 Sq. Ft.
30—304 SS shell & tube condensers 100-1000 Sq. Ft.

COMPRESSORS
1 Worth LTC-6 800 hp.
2 Clark RA-5 500 hp.
3 Penn Comps 100 CFM 500 lbs.
385 CFM 160 lbs.

MISCELLANEOUS
5—Bird Centrifugals 32 x 50, 24 x 36, 18 x 28.
5—Sweetland Filters No. 12, No. 10, No. 7, No. 5.
4—Rotary Vac. Filters, 10 x 12, 8 x 10, 5 x 8.
Lab Petro-Chem furnace 50,000 BTU/hr.
9—3' x 10' 410 SS Sheets.
Tremendous selection stainless steel and steel valves 1½"-6".
Goulds 16" pump, 10,500 gpm, 135' hd.

PARTIAL LIST ONLY
WIRE! PHONE! WRITE!
FOR DETAILED CIRCULAR
BRILL EQUIPMENT COMPANY
4101 San Jacinto St., Houston 4, Texas, JA 6-1351
OR
2401 Third Ave., New York 51, N. Y., CYpress 2-5703

PIPE 1/8" thru 30"
"FASTER from FOSTER"
TESTED & STRUCTURAL
Large Warehouse Stocks
• SPIRAL WELD • SEAMLESS
• ELECTRIC WELD • LAP WELD
• BUTT WELD • CONTINUOUS
RAILS - TRACK EQUIPMENT - PIPE - PILING
L. B. FOSTER CO.
PITTSBURGH 30 • NEW YORK 7 • CHICAGO 4
ATLANTA 8 • HOUSTON 2 • LOS ANGELES 5

FOR SALE EQUIPMENT

SALES AND RENTALS. Used cable drilling and fishing tools, casing, production equipment; from the Southwest's largest stock of oil field supplies. Degen Pipe and Supply Co., Tulsa.

FOR SALE: One Cardwell Single Drum Hoist, Model KS, Code Work—KSWW; complete with spudding attachment, D-8800 Caterpillar Diesel Power Unit, and mounted on 4-wheel trailer. Total operating time 2696 hours. Condition excellent. Price $4500. Michigan Chemical Corp., St. Louis, Michigan.

6000' TRAILER MOUNTED RIG: Houston Portable Drawworks, twin 671 GMC diesels with torque converter, 96' cantilever mast, 15 KW light plant, etc. Highway 281 south at San Antonio city limits. PE 4-9608.

ONE TIME OFFERING

Of Fabricators Excess Stock

Offered for Quick Sale—

NEW HOT ROLLED DOMESTIC STEEL PLATE

1/4"

30 Tons—24" to 36" Wide x 48" to 96" Long
25 Tons—36" to 47" Wide x 48" to 96" Long
13 Tons—48" to 60" Wide x 48" to 96" Long
10 Tons—50" to 59" Wide x 48" to 96" Long
125 Tons—60" Wide x 48" to 96" Long

5/16"

10 Tons—24" to 36" Wide x 48" to 96" Long
13 Tons—36" to 47" Wide x 48" to 96" Long
49 Tons—49" to 59" Wide x 48" to 96" Long
120 Tons—60" Wide x 48" to 96" Long

3/8"

3 Tons—24" to 36" Wide x 48" to 96" Long
29 Tons—36" to 47" Wide x 48" to 96" Long
30 Tons—48" Wide x 48" to 96" Long
14 Tons—49" to 59" Wide x 48" to 96" Long
207 Tons—60" Wide x 48" to 96" Long

PRICED @ $5.25 C.WT. NET F.O.B. MIDWESTERN AREA

Box J-919,
The Oil and Gas Journal,
Tulsa, Oklahoma.

FOR SALE EQUIPMENT

COMPRESSOR CYLINDERS: 3 Ingersoll-Rand 6" x 12", excellent condition, price $1,000 each, location Southwest Texas. Address Slick Secondary Recovery Corporation, Milam Building, San Antonio 5.

FOR SALE—1 Clark Brothers Engine Driven Compressor, 16 x 20, 180 R.P.M., 80 H.P., Serial #431 with one 7½ x 14 x 20 Compressor Cylinder, Type Q, Serial #5201 and one 14 x 20 Compressor Cylinder, Serial #5208. Completely assembled as one unit. Box J-925, The Oil and Gas Journal, Tulsa, Oklahoma.

SEISMIC EQUIPMENT

24 trace, SIE seismic recording truck, shooting truck, geophones, cables, 2 way radios, blaster, etc. Everything necessary to conduct operations in the field. All equipment in first class order and subject to inspection. Lease purchase provision possible. Contact

A & E Exploration Co.,

236 Central Bldg., Midland, Texas
Phone MUtual 2-3960 or MUtual 2-8661

LIQUIDATING

HEAT EXCHANGERS: Admiralty and Steel Tube capacity 240 to 1500 sq. ft.

RE-BOILERS High Pressure

COOLERS: Admiralty tube, capacity 200 to 650 sq. ft.

STEAM PUMPS—HOT OIL PUMPS

Miscellaneous refinery equipment from two major oil refineries now being liquidated. Send us your requirements. Good equipment at low prices.

BROWN-STRAUSS CORPORATION
1546 Guinotte Kansas City, Mo.
Phone HArrison 1-1000

FOR SALE EQUIPMENT

FOR SALE: 65,000 ft. good usable ¾" box & pin sucker rods, 12c per ft. Jamison Pipe & Tool, Phone 80-W, Madison, Kansas.

OIL FIELD Drilling Engines: 3—Waukesha 6 LROU Standard Oil Field Drilling Engines, $4,500.00 each. Hunt Drilling Co., Inc., 633 Wilson Building, Corpus Christi, Texas.

TANK TRAILERS FOR SALE

Bargains in used, late model Fruehauf tank trailers for

NATURAL GASOLINE
CRUDE OIL
ASPHALT (INSULATED)

All in excellent condition

for complete information write

Box J-911,

The Oil and Gas Journal,
Tulsa, Oklahoma.

FOR SALE

1200'—13⅜" OD 54# 8 Rd. Thrd. J-55, Range 2, Seamless Casing
2000'—10¾" OD 45.5# 8 Rd. Thrd. J-55, Range 2, Seamless Casing
2500'—8⅝" OD 32# 8 Rd. Thrd. J-55, Range 2, Seamless Casing
3000'—7" OD 20# 8 Rd. Thrd. J-55, Range 2, Seamless Casing
(The above is #1 used cable tool pipe located in Kansas.)
3750'—New 5½" OD 14# 8 Rd. Thrd. J-55, Range 2, Steel Casing.
6200'—2⅜" OD 4.70# E.U.E., Range 2 J-55, Steel Tubing.

Box J-909,

The Oil and Gas Journal,
Tulsa, Oklahoma.

TIDEWATER OIL COMPANY — Drumright, Okla.
MODERN 15,000 BBL./DAY REFINERY

presently being dismantled — Immediate removal and shipment — exceptional prices — your inspection invited — representatives on premises

COMPLETE UNITS

Houdriflow Catalytic CRACKING UNIT 8800 bbl./day. (new 1952)

Vacuum Crude Oil DISTILLATION UNIT 15,000 bbl./day (new 1953)

POLYMERIZATION UNIT 400 bbl./10#/day

ETHYL BLENDING PLANT 8500 gal.

Complete SKIMMING POND

110,000 gal. FOAMITE SYSTEM—complete

VALVE TESTING UNIT Ing. Rand 41X5

TELEMATIC 48 TANK GAUGING SYSTEM

50,000#/hr. COCHRANE WATER TREATING and Deaerating Plant

2—28 Spot CAR LOADING RACKS, capable 10 products each spot

FURNACE TUBES

500—New Croloy #5, 3" to 6⅝" OD 15 to 32' long

500—4", 4-6% Chrome, headers

200—4½", 4-6% Chrome, headers

200—5", 4-6% Chrome, headers

VESSELS

8'x32'3" ACCUMULATOR, 135 PSI @ 650° F.

6'x40' SOAKER, 500 PSI @ 850° F.

20'x28'4" AGITATOR, cone bottom

10,000 bbl. HORTONSPHERE

6500 gal. PROPANE TANK

WELDED TOWERS

8'x34'6"x½" 10 trays

6'x30'x½" 9 trays

5'x58'x⅜" 26 trays

4'6"x30'5"x⅜" 14 trays

PUMPS

HOT OIL 334 GPM, 1,000 PSI (2)

FIRE 2500 GPM at 426' head

CENTRIFUGAL from 60 to 1500 gal. from 40 to 655' head.

STEAM—Hot Oil—Simplex—Duplex

PROPORTIONING—1 to 5 HP

OTHER ITEMS

HEAT EXCHANGERS—196-3100 sq. ft. (25)

NEW STEEL STACKS—240'

53—STORAGE TANKS 1,000-100,000 bbl.

40—STORAGE TANKS 1,000-27,000 gal.

10 Ton OVERHEAD TRAVELING CRANE

PIPE—VALVES & FITTINGS—MACHINE TOOLS—WELDERS—HYDRAULIC JACKS—WAREHOUSE SUPPLIES—HAND TOOLS—LABORATORY EQUIPMENT—CHEMICALS—TRANSFORMERS—GENERATORS—ETC.

Write—Wire—Phone—for complete Information and Catalog

NEW YORK OFFICE—60 East 42 St., New York 17, N. Y. Murray Hill 7-5280
TULSA OFFICE—310 Thompson Bldg., Tulsa 3, Okla. Diamond 3-4890
DRUMRIGHT OFFICE—P. O. Box 587, Drumright, Okla. Phone 569

FOR SALE EQUIPMENT

FOR SALE

(LOCATED IN WESTERN KANSAS)

1951 Model Wilson Giant, 8000' capacity. Includes: Two (2) sets of 671 G. M. Diesel Motors Compounded 300 HP Transmission. 7¾" x 16" Gardner-Denver Pump. 17½" Oil Well Oil Bath Rotary Table. 126' Lee C. Moore Mast. Six 5¾" x 39' Drill Collars. Everything in excellent working condition. Full inventory available on request.

Price: $90,000

BOX J-924,

THE OIL AND GAS JOURNAL,

TULSA, OKLAHOMA.

FOR SALE OR TRADE

100,000' 2"

EXTERNAL UPSET TUBING

Brand new E.W. range 2 prime, tested, 3500 PSI with API couplings and threads delivered in carload lots only at low price or will trade for other size of new pipe and casing. For price or placement of orders phone or wire collect.

JIM BARNES

7808 CLYMER DR.
ST. LOUIS 23, Mo.
DAY: PR 3-3020
NITE: HU 1-5759

Priced For Quick Sale

70,000'—4" Used Line Pipe, 10.79 Lb., Drl., PE., Cleaned, Ready to Lay.
52c per foot.

32,000'—6" Used Line Pipe, 18.97 Lb., Drl., PE., Cleaned, Ready to lay.
$1.10 per foot.

Located Southeastern Kentucky

KENTUCKY PIPE & SUPPLY COMPANY

Mr. Charles Cooper

Phone 707

GREENVILLE, KENTUCKY

NEW GAS COMPRESSOR AVAILABLE FOR SALE

Electrically operated, of the following specifications:

Chicago Pneumatic Simplate Valve Gas Compressor, Serial No. 55045.
Size 12—12 x 7 Y D E
Direct connected to Allis-Chalmers Induction Motor NENA
Design Type AZZ—24 hrs., 150 H.P., 4,000 Volt, 3 phase, 60 cycle, 585 R.P.M.
Serial Number 1-5128-71084-1-1, 55° C rise.

Offers should be directed to the
SCRANTON SPRING BROOK WATER SERVICE COMPANY
30 North Franklin Street
Wilkes-Barre, Pa.

Unit can be inspected at the Generating Plant of the
SUNBURY GAS WORKS, Sunbury, Pa.

EQUIPMENT FOR RENT

Pipeline Equipment For Rent

Sidebooms, dozers, backhoes, ditchers, draglines and etc.

Earl Allen Construction Company,
3115 Buffalo Drive, Houston, Texas

BUSINESS SERVICE

Delaware Corporations formed and serviced. American Guaranty & Trust Company, P. O. Box 487, Wilmington, Delaware.

EQUIPMENT WANTED

WM. H. QUINETTE AND GEO. J. LEIDERMAN
OPERATORS
Suite 1238, Bank of the Southwest Building
HOUSTON 2, TEXAS

Require the following used equipment:

TEXAS GULF COAST:
Two Stage Compressors, gas engine driven.
1—30 to 450 psig. 800 to 1000 MCF/Day
1—30 to 600 psig. 1000 to 1200 MCF/Day
Separator or Large Scrubber
1—125# with controls.
Tanks
2—Low 500 bbl. bolted steel.

WEST TEXAS:
Pumping Unit:
1—84"/Stroke 30,000# beam, 320,000"/# gear box preferably equipped with electric motor drive.

ADVISE DESCRIPTION, CONDITION, LOCATION, ETC.

HELP WANTED

FOREIGN EMPLOYMENT. List oil companies, drilling contractors, seismograph contractors, showing where apply foreign jobs. $5.00 cash. OIML Co., Box 2603, Tulsa, Okla.

HELP WANTED

SALESMAN TO SELL oilfield specialties in North Texas area. Excellent opportunity for aggressive salesman. Salary and commission. Advise age, experience and if presently employed. All replies confidential. Box J-916, The Oil and Gas Journal, Tulsa, Oklahoma.

REFINERY TECHNOLOGIST

If you are a Chemical Engineer with 3 to 5 years experience in refinery process engineering or operation and economic analysis and have an interest in consulting and technical service type work, you should investigate this unique opportunity to capitalize on your background and to participate in the growth of an expanding technical activity of a well known company allied to the refining industry. This position offers a wide variety of assignments, industry-wide contacts with refining and process companies, for using initiative and originality to increase responsibility. A midwest suburban location offers ideal professional environment. Send resume of qualifications to

Box J-891,
The Oil and Gas Journal,
Tulsa, Oklahoma.

PETROLEUM ENGINEERS AND GEOLOGISTS

"Tramancor" not only recruits technical and top administrative manpower; it is retained by Majors, Independents and Contractors with foreign interests to conduct salary studies and to determine equitable compensation for various levels of responsibility in every part of the world. This background can be focused on your qualifications. The cost is a confidential letter to

Harold Allen, Recruiting Manager

TRANSWORLD MANAGEMENT CORPORATION

120 East Ocean Boulevard, Long Beach 2, California

ENGINEERS

DESIGN AND CONSTRUCTION

NEWLY FORMED SUBSIDIARY OF MAJOR OIL COMPANY has immediate openings for graduate engineers experienced in petrochemical and refinery design and construction. Due to expansion of petrochemical activities, unusual career opportunities are available for qualified men at junior, intermediate and advanced employment levels in applicable engineering work.

Positions offer stable employment, a liberal, well balanced group of employee benefit plans and salaries commensurate with training and experience.

Forward complete employment resumé together with recent photograph, details concerning age, marital status and education background to the Employment Office, P. O. Box 1712, Brownsville, Texas. All replies will be confidential and interviews for qualified applicants will be arranged at the plantsite.

AMOCO CHEMICALS CORPORATION

Subsidiary of Standard Oil Company (Indiana)

BROWNSVILLE, TEXAS

HELP WANTED

RECENT GRADUATE in Chemical Engineering. Position with independent oil company offers excellent opportunities for advancement and varied experience in gasoline plant operations. Prefer married man under 30. Send details of education, experience, personal background, and salary requirements to P. O. Box 3053, Dallas, Texas.

PRODUCTION SUPERINTENDENT—Contractor-Producer needs general superintendent production, principally gas, headquarters Guymon, Oklahoma. Engineering education preferred. Good opportunity for man with proper qualifications and not afraid of field work. Replies should include details of experience, education, and personal history, with expected salary. All replies confidential. Write Box J-893, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

DRAFTSMAN: Geophysical computing experience preferred. Ideal working conditions in permanent location. Major oil company security and benefits. Salary commensurate with experience. Write to Employee Relations Supervisor, Box 731, Tulsa, Oklahoma.

LABORATORY MANAGER
For Core Analysis Laboratory
Rocky Mountain Area

Requires knowledge of basic core analysis and interpretation of data. Background of administrative supervision desirable. Salary open.

Chemical & Geological Laboratories
P. O. Box 279, Casper, Wyoming

HELP WANTED

MARKET DEVELOPMENT. Growing organic chemical company expanding market development activities. Immediate opening. Chemical degree necessary. Petroleum and grease industry experience desirable. Eastern location. Please submit complete resume and salary requirements. Box J-903, The Oil and Gas Journal, Tulsa, Oklahoma.

HEAT TRANSFER ENGINEER

Young man 28 to 35 years capable of design, rating and sales of heat exchangers. Established fabricator located in S.W. City of 300,000.

Reply stating full particulars as to education, employment background and qualifications.

Salary commensurate with experience and ability. All replies kept confidential. Reply to

BOX J-904,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

GEOLOGIST - LANDMAN

Independent Oil Company has opening for experienced, aggressive combination geologist and landman. Must have thorough understanding of geological and land matters in Mid-Continent area and be prepared to handle full exploration program. Age limit 40. This is salaried position with excellent pay. In replying, give past employment record and educational background. All replies confidential. Reply

Box J-926, The Oil and Gas Journal,
Tulsa, Oklahoma.

OPERATING ENGINEER
For Writing Operating Manuals

To compose operating instructions for petroleum refinery, chemical and petrochemical plants. Will also assist in activities of New York Operating Department.

Graduate Chemical or Menchanical Engineer with minimum 5 years experience in performing similar work with petroleum refiner or contractor. This is a challenging position with an excellent opportunity for growth.

Please airmail in confidence complete chronological resume, including education and employment, salary history and salary requirements, to Personnel Department

HYDROCARBON RESEARCH, INC.
115 Broadway New York 6, N. Y.

GULF OIL CORPORATION
— ENGINEERS —

PETROLEUM **RESERVOIR**
GAS **MECHANICAL**
DRILLING **PIPE LINE**

Subsidiary operating in Venezuela has opportunities for engineers with/without experience. Salary commensurate with experience.

P. O. BOX #35
Bowling Green Station, New York 4, New York

DEVELOPMENT CHEMISTS

GROUP LEADER—

with MS or PHD and 10 years experience in various phases of emulsion polymerization, rubber, surfactants. Eastern location.

DEVELOPMENT CHEMIST—

at Group Leader level for challenging work in petroleum production problems. Prefer an MS or PHD with 8 to 10 years experience. A knowledge of surfactants and emulsion chemistry and their application to the petroleum industry highly desirable. Texas location.

A progressive rapidly growing leader in the field of industrial chemicals offers these outstanding opportunities for your growth. For further information, send complete resumé to:

BOX J-907,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

PETROLEUM ENGINEERS

(Ages 30-38)

A major integrated U. S. oil company operating in Venezuela has outstanding career opportunities for RESERVOIR and PETROLEUM PRODUCTION ENGINEERS. Graduate petroleum, mechanical or chemical engineers who have a minimum of seven years of PETROLEUM ENGINEERING experience are invited to send a resume of personal data and work experience. Naturally, all replies will be held in confidence and interviews arranged for qualified candidates. Salary, including bonus, $16,500 - $18,000, depending on qualifications and experience. Excellent employee benefits, including home vacations with travel expenses.

Box 480
Dept. Y-21
New York 19, N. Y.

HELP WANTED

EXPERIENCED Core Analyst for lab work in Oklahoma area. Box J-920, The Oil and Gas Journal, Tulsa, Oklahoma.

PROCESS ENGINEER with thorough technical training and minimum background of eight years refining and hydrocarbon processing experience with special emphasis on catalytic reforming and petrochemicals. Send complete record of education, experience, and minimum salary expected. Write Box J-867, The Oil and Gas Journal, Tulsa, Oklahoma.

Pipe Line Engineers

Career Opportunities for Graduate Engineers experienced in estimating-economic analysis or design of oil and gas pipe lines. Openings in the United States and abroad.

All communications strictly confidential.

Pipe Line Technologists, Inc.
P. O. Box 6957—Houston 5, Texas
Phone JA 6-1221

PETROLEUM ENGINEERS
PRODUCTION SUPERVISORS

Expanding production operations on Sumatra, Indonesia offer overseas assignment opportunities and good advancement possibilities for graduate engineers with the following experience:

PETROLEUM ENGINEERS—
2 - 5 years in drilling or production.

JR. PETROLEUM ENGINEERS—
Under 2 years drilling or production experience for participation in domestic training program prior to assignment overseas.

PRODUCTION SUPERVISORS—
5 - 10 years oil field production experience, including well workovers, servicing, supervision natural flow and pumping wells, field gathering and pumping stations.

Salary commensurate with background and qualifications. Liberal employee benefits and allowances.

Send detailed resume to:

CALIFORNIA TEXAS OIL CO., LTD.
380 MADISON AVENUE
NEW YORK 17, N. Y.
c/o Personnel Dept.

HELP WANTED

MANUFACTURERS representative for North Texas to sell established line of pumping specialties. Give age, experience and number of years in territory, also lines now being handled. All replies confidential. Box J-917, The Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEERS
DESIGNERS
DRAFTSMEN

All classifications. Experienced in pipeline pump station, compressor station, structural, piping, or electrical design. Field and general office positions open U. S. and foreign. Send resume to:

Personnel Manager

Williams Brothers Company
Worldwide Engineers and Constructors
324 NBT Bldg.
TULSA, OKLAHOMA.

ENGINEER
OIL REFINERY OPERATIONS
SANTOS, BRAZIL

Acceptable applicant must have:

1. **Accredited engineering degree, preferably chemical engineer.**
2. **Minimum 4 years experience oil refinery process engineering,**

and be qualified to specify changes in those control operations required to modify quality & quantity of end products. Preferred, but not mandatory, that applicant have experience as advisor of oil refinery management on process operations.

Salary commensurate with experience. Living allowance in Brazilian currency and round trip air transportation provided for applicant and family. Minimum one year assignment.

Mail complete chronological resume, including education and employment (names and addresses of employers, salaries, dates employed, positions held, scope of responsibility and title of immediate superior), to Personnel Department.

HYDROCARBON RESEARCH, INC.
115 BROADWAY NEW YORK 6, N. Y.

DELAWARE FLYING A REFINERY
Engineers • Attractive Opportunities
Nation's most modern refinery

Excellent working conditions. Outstanding employee-benefit programs. Good housing. Fine schools. Diversified cultural and recreational facilities. Applicants must have M.E. or Ch.E. degree, one to five years' experience in any phase of industrial operations. Write, wire or phone:

Employee Relations Department O
TIDEWATER OIL COMPANY
Delaware City, Delaware • Phone TAylor 4-4581

HELP WANTED

PETROLEUM ENGINEER with Master's Degree, or Doctor's in Chemical, Mechanical, or Petroleum Engineering for research and teaching in Petroleum Production Engineering at rapidly growing southwestern institution. Rank and salary open, twelve months employment possible, consulting work encouraged and available in immediate area. Applications will be kept confidential. Box J-902, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

GEOPHYSICIST-GEOLOGIST: Twelve years seismic supervision, interpretation, review, two gravity, two surface. Louisiana, Texas, New Mexico. Desires permanent position domestic, foreign. Box J-927, The Oil and Gas Journal, Tulsa, Oklahoma.

LANDMAN-LAWYER: Five years land title experience with major and independent in gulf coast, West Texas and Rocky Mountain areas. Married, age 31. Desire land or legal position. Box J-935, The Oil and Gas Journal, Tulsa, Oklahoma.

TWO SALES-ENGINEERS or engineers with seven to twenty years diversified experience in general and oil field machinery, six years handling natural gas compressors, extensive contacts. With present employer six years. Desires position with a future. Interview. Box J-931, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCTION MAN: Desires responsible position in producing operations. 31 years experience from roustabout to production superintendent with one major company. Age 51. Best of references. Mid-Continent area preferred. Box J-913, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST: Four years experience in well sitting, field development and subsurface work desires to relocate in Illinois basin or eastern U. S. Available April 15. Box J-914, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST: Eleven years experience in drilling well supervision, subsurface geology and geological-geophysical correlation. Desire foreign employment. Prefer Canada or South America. Box J-922, The Oil and Gas Journal, Tulsa, Oklahoma.

OFFICE MANAGER with small independent. Twenty-five years experience in office management, production leases, taxes, accounting and public relations. Presently self employed. References. Prefer Tulsa area. James A. Hayden, 1500 So. Frisco, Tulsa.

EXECUTIVE: Extensive contracting const. and eng. background on executive level in oil refining and chem. plant fields. Reg. prod. eng. Also consider financial interest small eng. & const. firm. Available 60 days. Box J-933, The Oil and Gas Journal, Tulsa, Oklahoma.

LANDMAN: Extensive major and independent experience, 35, LLB, interested in association with independent in Mid-Continent or Rockies. Could furnish land and geological organization for new company. Box J-932, The Oil and Gas Journal, Tulsa, Oklahoma.

EXECUTIVE ASSISTANT: Mr. Executive—Would you hire an able assistant to relieve a portion of your existing work load if you could find a person who met your requirements of ability, ambition and initiative? Aggressive young executive seeks personal growth opportunity to prove that a few of this calibre still exist. Successful background provides nine years of well rounded business experience. Oil experience from promotion to production. Ability to interpret reports from balance sheets to electric logs. Desire challenge with established independent, investment group, supply or service organization. Age 34. Married, B.S. degree. Qualified reason for change. Will relocate. Complete resume to interested parties. Box J-929, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL REFINERY ACCOUNTANT, 18 years experience; especially well qualified yields, system, statistics. Thoroughly familiar actual refinery operations, blends, and processing reports from crude oil at well through to service stations, including transportation by rail, tank truck and pipeline. Prefer location gulf coast or Mid-Continent area.
Box J-928, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

PRODUCTION SUPERINTENDENT. Twenty years varied production experience, Mid-Continent. 15 years supervisory, completions and workover. Presently employed. 1802 Seneca, Enid, Oklahoma. Phone ADams 7-2195.

PETROLEUM ENGINEER, 15 years field, office, reservoir, gas utilization experience. Former chief gas engineer large state agency. Declined new contract gas advisor Saudi Arab Government account war danger. Desires position government or financial institution advisor or government representative of operator or consultant. Write Hall, 1103 Summit, Austin, Texas.

SUPERVISOR, TOOLPUSHER. National and foreign experience. Cable tools. Twenty-five years experience, references. Foreign work preferred. Box J-921, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST: Desires responsible position with an independent or drilling Co. in Dallas. Seven years experience, sub-surface geology, drilling production, workover in N.W. and S.E. New Mexico, West and West Central Texas. Single, free to travel. Box J-882, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPLORATION MANAGER: Age 38. Seventeen years experience in executive management and exploration coordination. Geological education. Desires association with individual or independent company on retainer and participation basis. Box J-923, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPERIENCED LANDMAN. Eight years all phases, excellent recommendations. Age 33. Box J-915, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCTION WANTED

PRODUCTION WANTED: Leases with production, prefer West or Central Texas. Must have supporting records. Box J-918, The Oil and Gas Journal, Tulsa, Oklahoma.

WANT TO BUY—Oil Properties, settled or semi-settled production. 100 to 5,000 barrels daily in Oklahoma and Kansas. Contact Morris Sitrin, 1215 First National Building, Tulsa, Oklahoma.

PRODUCTION FOR SALE

FOR SALE: Fifty stripper oil wells, fourteen hundred feet deep, near major company water flood. Box J-880, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCING ROYALTIES, Over-riding royalties and Production carefully selected. We specialize in producing properties. Banks will accept for collateral. Write P. O. Box 3688, Tulsa.

REAL ESTATE

FOR SALE: Ten room house, half acre lot exclusive San Antonio suburb, swimming pool. Owner. Fred Cooper, 2001 North Main, San Antonio, Texas.

FOR SALE MAPS

JUST RELEASED

Map (1) Geologic & Structure Map of Aneth Field—Paradox Basin

Chart (1) Correlation Chart of all Wells In Aneth Oil Field

Table (1) Basic Figures on all Wells In Aneth Oil Field—Utah

Wildcat Map of Colorado Plateau

Compiled and Published by Raymond C. Robeck

Consulting Geologist,

535 Orchard Ave., Grand Junction, Colo.

OTHER MAPS AVAILABLE DISTRIBUTED BY:

EMPIRE BLUE PRINT & SUPPLY CO., INC.

BOX 1194,

GRAND JUNCTION, COLORADO

708 Main, Durango, Colo.

STRIP LOG CABINETS

MORE LOGS ARE FILED in Kraftbilt Strip Log Cabinets than all others combined. Loaded drawers glide smoothly on roller bearings. Three drawers per section, add sections as needed. Built to last a lifetime! Send for Catalog 57-B, Ross-Martin Co., P. O. Box 800-A, Tulsa 1, Okla.

SERVICES

CHAVES COUNTY, N. M.

Major Co.; well to drill testing Devonian & Ellenberger zones. Should be next major success. Recommend close in royalty & leases. Data on request.

W. J. Peterman, Geologist

Exploration 1918-1957 Engineering
Portales New Mexico

SCOUTING

VENEZUELAN OIL SCOUTING AGENCY

Reports—maps—newsletter

Cable: VOSA, Caracas
Mail: Apartado 3963
N. VanMiddlesworth
Phone: 54 48 02

The Alaska Scouting Service

Bi-weekly reports on All-Alaska Exploration.

Address: Box 2278, Anchorage
Correspondence to:
5240 University Way Phone: KE 6584
Seattle 5, Washington

BUSINESS OPPORTUNITIES

OIL AND GAS FINANCING. Second mortgage loans; development drilling; oil payments purchased; bank loans arranged. If you are competent and honest and have a sound property, we can help you. Resources Recovery Company, Box J-910, The Oil and Gas Journal, Tulsa, Oklahoma.

INDEPENDENT equipment dealer representing twenty-four major manufacturers, oil field and industrial, desires corporate partner with minimum of $20,000.00. Excellent returns on investment. OLive 4-7510, Houston, Texas.

MOBILE HOMES, Office Trailers: Sales, leases, terms. MOBRO CORP., 9441 East Admiral Pl., Tulsa, Okla. Phone TE 5-0283.

FINANCIAL CONTACTS. Underwriters. Brokers, Private Finders of Capital reached. No shopping. Confidential. FREE ENTERPRISE ASSOCIATES, 817 51st St., Brooklyn, N. Y.

NEW DESIGNS

I have developed an instrument which I believe will give a greater depth of energy from the shot for better seismic wave with my style of shooting. If you are interested I will send drawing of unit describing its use to any member of Oil Co.'s staff and to members Geophysical Exploration Co.'s staff. Write to
FRANK J. LEVEQUE,
28 So. 6th., Albion, Ill.

COVER THE HOTTEST MARKET FOR OIL SUPPLIES

Frequent discoveries of light oil in Saskatchewan (33 producing wells in one week) have created a tremendous demand for oil field supplies. Responsible party with excellent connections in the oil industry, and having a well organized and bonded sales staff would like to contact manufacturers of reputable products with a view to representing them for sales and distribution in this area.

Contact Box 485

Regina, Saskatchewan,

Canada

LEASE AND DRILLING BLOCKS

40-ACRES LEASE testing Arbuckle Lime. Around 1900 ft. deep. ½, $400, ½, $400, ⅛, $750, ¼ $1500. L. Price, Coweta, Okla.

UTAH OIL LEASES on U. S. owned land in all counties where leasing active. 640 acre leases. 5 years and renewable 5 more. Free information. John L. Donahue, Empire Bldg., Denver 2, Colorado.

OIL LEASES IN BOOMING

4-Corners Area. November Indian Lease sale brought 30 Million Dollars. Some leases sold for $3,200 per acre. Wells estimated up to 1500 barrels of oil per day. Oil Leases from $2.25 an acre. Fortunes being made. Write for free information now.

ATLAS OIL SURVEY
Dept. OJ-2, Colorado Bldg.
Denver 2, Colo.

DISCOVERY WELL

Depth 1600'—Tulsa Co., on 200 acres, not fractured. Making no water, averaged 15 B/daily during 1956. Engineers state fracture will multiply production in offset locations. Geologist reports every location should produce. Drilling Co., owners—will drill and complete one or more offset wells into tanks and pipeline for you at cost.—For a one half interest. Total cost, $17,000. Oil $2.99 P/B. Present allowable 25 B/Day. Write
BOX J-934,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

WANTED

WANT TO PURCHASE stripper production that can be reworked and stimulated with fracturing. Box J-899, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCTION WANTED

Leases with good production and excellent reserves. Producing royalty also needed.

P. O. Box 12103 Preston Station,
Dallas, Texas.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Santa Fe, New Mexico. Notice is hereby given that approximately 885.40 acres of land in five parcels within the known geologic structure of certain fields in Lea, Rio Arriba and San Juan Counties, New Mexico, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre at 2:00 P.M. MST, February 19, 1957, when bids will be opened. Details of the lease offering, how and where to submit bids, may be obtained from the Bureau's Land Office at Santa Fe, New Mexico. Douglas E. Henriques, Manager.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Land Office, Billings, Montana. Notice is hereby given that approximately 899.49 acres of land within the known geologic structure of Cedar Creek Field in Montana and North Dakota will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre at 10:00 a.m. M.S.T., March 28, 1957 when bids will be opened. The following are the lands offered for sale: Parcel No. 1: T. 11 N., R. 58 E., P. M., Montana, Sec. 30, Lots 1, 2, 3, 4, E½ SW¼, containing 233.20 acres. Parcel No. 2: T. 5 N., R. 60 E., P. M., Montana, Sec. 10, NW¼ NW¼ S½ NW¼, SW¼ containing 280 acres. Parcel No. 3: T. 5 N., R. 61 E., P. M., Montana, Sec. 2, Lot 4, containing 48.91 acres. Parcel No. 4: T 130 N., R. 107 W., 5th P. M., North Dakota, Sec. 1, Lot 1, SE¼ SE¼ containing 79.99 acres. Parcel No. 5: T. 130 N., R. 106 W., 5th P. M., North Dakota, Sec. 21, Lots 8, 11, W½ NW¼, containing 121.64 acres. Parcel No. 6: T. 130 N., R. 106 W., 5th P. M., North Dakota, Sec. 28, SE¼ NW¼, E½ SW¼, Sec. 32, Lot 4, containing 135.75 acres. Details of the lease offering, how and where to submit bids, may be obtained from the Manager of the Land Office 1245 North 29th Street, Billings, Montana. Theo E. Anhder, Manager, Land Office.

Reed Roller Bit Names Four Regional Representatives

Joseph A. Kelly, James J. Young, Thomas M. Sanders, and Albert W. Short have been promoted to the position of regional representatives for Reed Roller Bit Co. H. B. Book, vice president, made the announcement.

All of the men were special salesmen for Reed before their appointments. Kelly is of the Dallas office, Young of the Tulsa office, Sanders at New Iberia, and Short at Houston.

Tube Turns Plastics Names Sheehy As District Manager

James L. Sheehy has been appointed district manager of the western area recently established by Tube Turns Plastics, Inc., Louisville, Ky. The announcement was made by Carl B. McLaughlin, vice president. Sheehy will headquarter in San Francisco. The western area comprises California, Oregon, Washington, Wyoming, Montana, Utah, Arizona, Nevada, and Idaho.

American Meter Adds Coldren and Rouse

Eugene D. Rouse and Jack S. Coldren have been named sales representatives for the Garland, Tex., and Fullerton, Calif., sales districts of American Meter Co. They have completed a 6-month training school at Erie, Pa. C. Benson Dushane, vice president, made the announcement.

Elliott Co. Names Bach As Sales Manager

Howard A. Bach has been appointed sales manager of Lagonda Division (tube cleaners and tube expanders), Elliott Co., Springfield, Ohio. Bach joined the company in 1951. In 1953 he was assigned to the Detroit office as a field engineer. In 1955, he was transferred to the Lagonda Division as assistant sales manager.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, BUREAU OF INDIAN AFFAIRS, Jicarilla Indian Agency, Dulce, New Mexico. Notice is hereby given that approximately 124,843 acres, more or less, of Jicarilla Tribal Indian lands in 53 tracts located in Sandoval and Rio Arriba Counties in New Mexico within the Jicarilla Apache Indian Reservation, will be offered for oil and gas leasing through competitive bidding to the highest responsible bidder for a cash bonus consideration in addition to stipulated rentals and royalties through sealed bids received on or before 3:00 P. M. (MST), February 28, 1957, when bids will be opened. Each tract containing approximately 3 to 4 sections each, is offered for lease separately. Details of the lease offering, and how and where to submit bids, may be obtained from the Superintendent, Jicarilla Indian Agency, Dulce, New Mexico, upon request.

ADVERTISERS IN THIS ISSUE

ACF Industries, Incorporated, Valve Division 41
Allis-Chalmers Mfg. Co. 11
Allis Co., The Louis 164
American Chain Division of American Chain & Cable 142
American Iron & Machine Works Co. 124
Armour Chemical Division Armour and Company 48, 49
Associated Brine Industries 193
Atlas Powder Company, Aquaness Department 16, 17
Axelson Manufacturing Company, A Division of U. S. Industries, Inc. 180, 181
Aztec Manufacturing Co. 126, 127

B J Service, Inc. 20, 21
Baash-Ross Tool Company 10
Baird Mfg. Co. 119
Bakelite Company A Division of Union Carbide and Carbon Corporation 23
Baker Oil Tools, Inc. 79
Baylor Co., Inc., The 145
Beaird Company, Inc., The J. B. 37, 38
Beech Aircraft Corporation 76, 77
Bethlehem Supply Co. 123
Brewster Company, Inc., The 197, 198
Brine Service Division of Corpus Christi Salt Co. 193
Brown Oil Tools, Inc. 128
Carbide and Carbon Chemicals Company, A Division of Union Carbide and Carbon Corporation 13
Caterpillar Tractor Co. 138
Central Scientific Company 12
Charles Machine Works, The 146
Chevrolet Motor Div., General Motors Corp. 36
Chicago Bridge & Iron Company 75
Clark Equipment Company 34
Classified Advertising— 207, 208, 209, 210, 211, 212
Continental-Emsco Company 42, 43
Cooper, Inc., Fred E. 167
Core Laboratories, Inc. 170
Crose Manufacturing Co., Inc., M. J. 140
De La Mater, Ray E. 117
De Laval Steam Turbine Co. 152, 153
DeZurik Corporation 162
Dorr-Oliver Incorporated 8
Dow Chemical Company, The 32
Dowell Incorporated 88, 90, 214
Drilling & Service, Inc. 194
Duff-Norton Company 43
du Pont 35
Edward Valves, Inc. 144
Electro-Motive Division, General Motors 30, 31
Electro Rust-Proofing Corp. 50
Emsco Screen Pipe Company 168
Enjay Company, Inc. 53
Ensign Carburetor Company 27
Fairbanks, Morse & Co. 4
Fischer & Porter Co. 136
Fleet-Line Co. 117
Flexitallic Gasket Company 148
Franks Division Cabot Shops, Inc. Inside Back Cover
Fuller Company 22
Gaso Pump & Burner Mfg. Co. 132
General American Transportation Corporation 56
Goodrich Company, B. F. 5
Gorman-Rupp Company, The 120
Grancell, I. H. 144
Grant Oil Tool Co. 147
Guiberson Corporation 52
Halliburton Oil Well Cementing Co. 15
Helicoid Gage Division, American Chain & Cable Co. 47
Houston Oil Field Material Company, Inc. 178
Hughes Tool Co. Back Cover
Inferno Co., The 188
Ingalls Shipbuilding Corporation, The 40
International Nickel Company, Inc., The 80
Isotopes Spec. Co., Inc. 134
Jenkins Bros. 19
Jensen Brothers Mfg. Co., Inc. 184
Jet-Lube Inc. 189
Jones & Laughlin Supply Division 51
Kelley Company, Ben F. 161
Larkin Packer Company, Inc. 190, 191
Linde Air Products Company, A Division of Union Carbide and Carbon Corp. 131
Link-Belt Company 7
Lone Star Steel Company 58
Macco Oil Tool Co. 161
Magnet Cove Barium Corp. 55
Manning Co., Charles E. 142
Marshalltown Manufacturing Co. 159
Martin-Decker Corp. 188
Master Electric Company, The 44
McKissick Products Corporation 186
Memphis Equipment Company 117
Mercantile National Bank 159
Mid-Continent Supply Company 160
Minneapolis-Honeywell Regulator Co., Industrial Division 24, 25
Minneapolis-Moline 14
Mission Mfg. Company 163
Moore Corporation, Lee C. 182
Morgan Stanley & Co. 192
National Aluminate Corp. 83
Nordstrom Valve Division, Rockwell Manufacturing Company Inside Front Cover
Oil and Gas Journal, The 140
Oil Center Tool Co. 39
Oil Metering and Processing Equipment Corp. 156
Oil Well Supply Division 6
Oliver Corporation, The 9
Orbit Valve Company 46
Otis Pressure Control, Inc. 54
Pacific Lumber Company, The 134
Peerless Supply Co., Inc. 193
Rector Well Equipment Co., Inc. 26
Reda Pump Company 53
Refinery Supply Co., The 159
Reilly Tar & Chemical Corp. 158
Republic Steel Corporation 154, 155
Robbins & Myers, Inc. 183
Rockford Clutch Division of Borg-Warner Company 189
Rockwood Sprinkler Company 143
Ross Heat Exchanger Division of American-Standard 33
Ryerson & Son, Inc., Joseph T. 165
Scott-Rice Company 146
Seismograph Service Corp. 175
Southland Battery Co. 146, 161, 193
Templeton, Kenly & Co. 146
Thomas Flexible Coupling Co. 185
Thompson Tank & Manufacturing Co., Inc. 134
Thompson Tool Co. 196
Thornhill-Craver Co. 28
Trane Company, The 148, 149
Tretolite Company A Division of Petrolite Corporation 29
Tulsa Paper Company 193
Union Carbide and Carbon Corporation, Bakelite Company 23
Carbide and Carbon Chemicals Company 13
Linde Air Products Company 131
United States Steel Corporation— Oil Well Supply Division 6
Vogt Machine Co., Henry 151
Wallace & Tiernan, Incorporated 50
Wall Colmonoy Corporation 156
Weatherford Oil Tool Co., Inc. 195
Well Equipment Mfg. Corp. 18
Wheland Company, The 172
Wilson Manufacturing Co., Inc. 187
W-K-M Manufacturing Company, Inc., A Subsidiary of ACF Industries Incorporated 41
Young Radiator Company 188

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Land Office, Cheyenne, Wyoming. Notice is hereby given that approximately 321.24 acres of land in 5 parcels within the known geologic structure of the Kirby Creek field, Wyoming, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre through sealed bids on or before March 5, 1957, when bids will be opened. Details of the lease offering, and how and where to submit bids, may be obtained from the Land Office, Cheyenne, Wyoming. Edward Gillette, Acting Manager.

THESE TESTS PROVE CORBAN PREVENTS CORROSION BEST

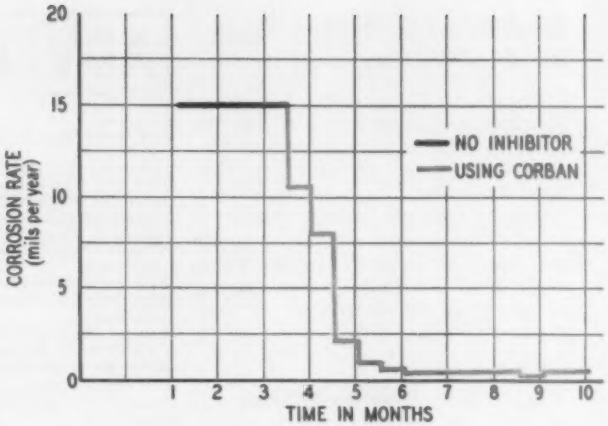
Many methods of stopping corrosion have been tried. Corban®, developed by Dowell, is proving to be both effective and economical. The tests at right show the actual results that have been realized with Corban.

Test Corban on your own corrosive wells. You'll find that proper application of Corban will result in money-saving reductions in equipment failures – time and again!

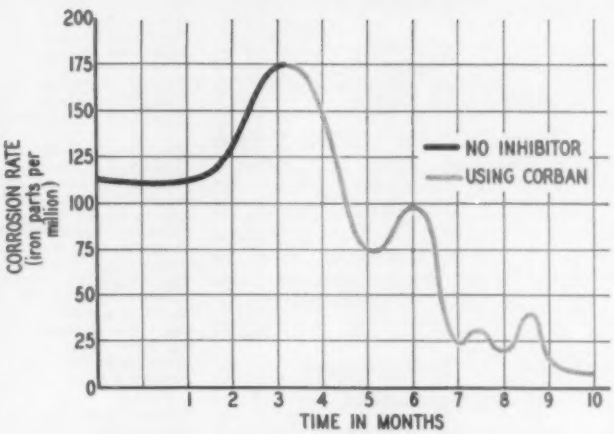
Field experience has proved that Corban extends the life of tubing, casing, fittings, and valves. It also saves time and production by helping avoid workovers necessitated by corrosion-damaged equipment.

Corban, a polar-type inhibitor, is carried throughout the well by the oil or brine, coating all metal surfaces. This durable coating shields the casing, tubing, valves, fittings, and pumping equipment against corrosive agents. Corban is easy to use – does not aggravate emulsion problems. It is available as a "ready-to-use" liquid, a concentrated liquid, or in stick form; also in several formulas to meet any specific well requirements.

Let us recommend a program of well treatment designed especially for your wells. Call any of the 165 Dowell offices in the United States and Canada. In Venezuela, contact United Oilwell Service. Or write Dowell Incorporated, Tulsa 1, Oklahoma.



1 STANDARD TEST uses metal strips inserted in wellhead or tubing. Surface penetration or weight loss indicates degree of corrosion.



2 FLUID ANALYSIS is quick test of corrosion in gas condensate wells. Chart shows parts per million of dissolved iron in water sample.

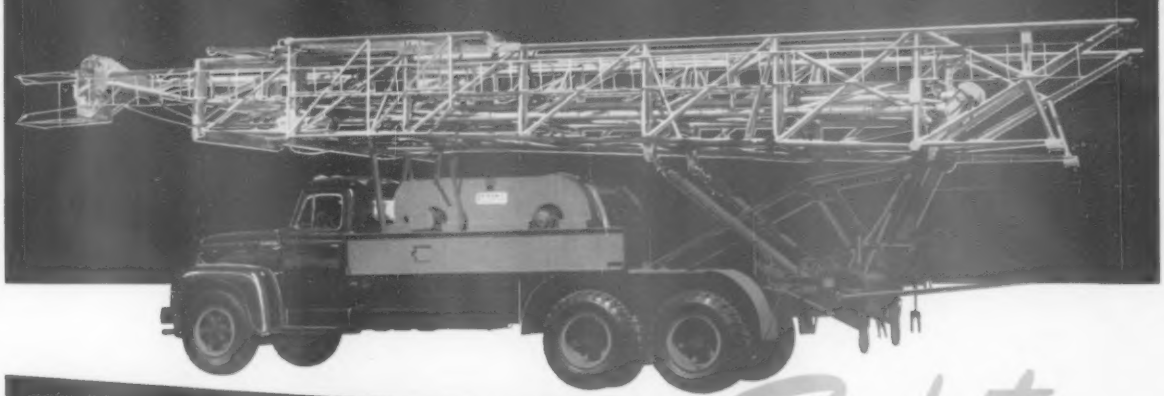
you can depend on

DOWELL

A SERVICE SUBSIDIARY OF THE DOW CHEMICAL COMPANY

move FASTER

. . . AND GET ON PAYING JOBS *FASTER*



with a FRANKS *Rocket*

Economical Well Pulling Power

The ROCKET gets you to the job economically . . . then, on the job, the ROCKET is designed and equipped to handle any well servicing operation quickly and easily. The telescoping derrick accommodations protects rods and tubing and saves time coming out and going in. There's three ROCKET models . . . one with the most economical capacity to handle work in your area. There's one with a tandem front end affording better weight distribution. Look over Franks before you buy.

Only Franks offers "on the spot" field service with stock of parts and factory-trained personnel at: Alice, Compton, Casper, Farmington, Great Bend, Houston, Kilgore, Odessa, Seminole, Edmonton and Tulsa.

For specifications, performance data or prices . . . write:

FRANKS Division, Cabot Shops, Inc. P. O. Box 3218, Tulsa, Oklahoma.

WELL SERVICING AND DRILLING UNITS

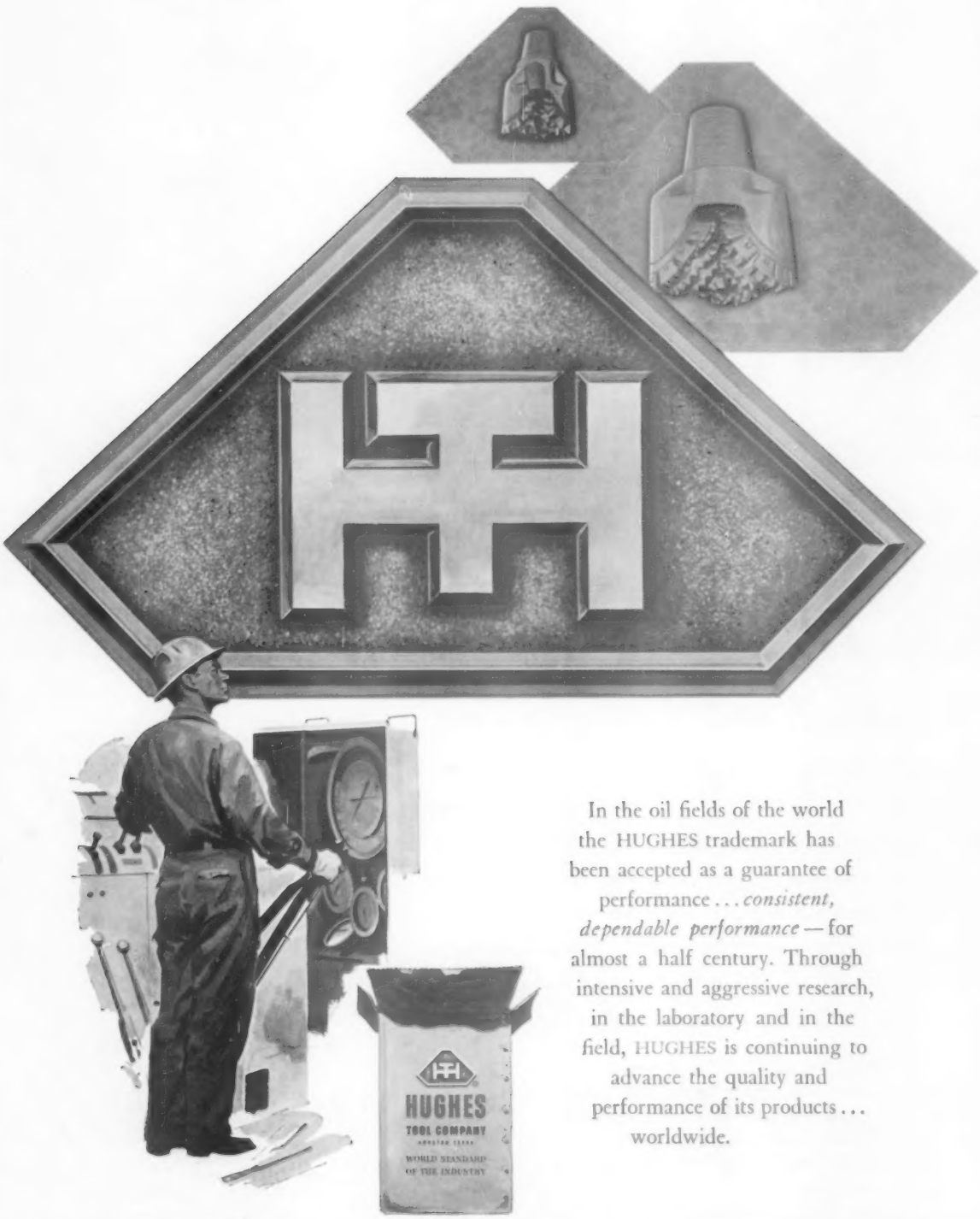
FRANKS

DIVISION OF

CABOT SHOPS, INC.

TULSA, OKLAHOMA

YOUR GUARANTEE OF PERFORMANCE



In the oil fields of the world the HUGHES trademark has been accepted as a guarantee of performance . . . *consistent, dependable performance* — for almost a half century. Through intensive and aggressive research, in the laboratory and in the field, HUGHES is continuing to advance the quality and performance of its products . . . worldwide.